

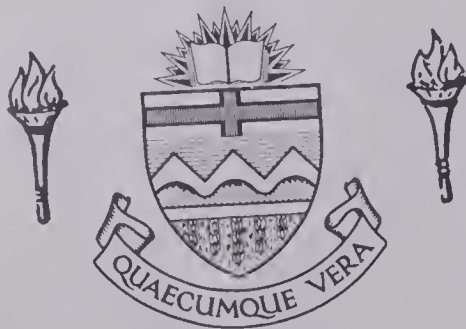
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VERBAL HIERARCHICAL CLASSIFICATION IN
DISABLED AND ABLE MALE READERS

by



DONNA BETTY REDIGER

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled Verbal Hierarchical Classification in Disabled and Able Male Readers submitted by Donna Betty Rediger in partial fulfillment of the requirements for the degree of Master of Education.

ABSTRACT

The major purpose of this study was to make an exploratory investigation of one aspect of concept formation ability, namely verbal hierarchical classification ability of disabled readers. Proficiency in the ability to form hierarchical classifications was assessed through pupil performance on a series of tasks, each of which required the formation and expression of a class concept.

The thirty-one disabled readers who participated in the study were boys who were receiving remedial reading instruction in a clinical situation. They were in either grade four or grade six in the regular classroom setting. The thirty-five able readers were boys who were in either grade four or grade six in three elementary schools. All pupils attended public school in a large urban centre.

For descriptive purposes, data were obtained on the mental ability and reading ability of each pupil in the study. Data on verbal and non-verbal intelligence quotients were obtained through the administration of the Canadian Lorge-Thorndike Intelligence Tests, Levels A to F, Form 1. The Gates-MacGinitie Reading Tests, Survey D, Form 3 provided current data on reading achievement.

To assess the ability of disabled and able readers to form and express hierarchical class concepts, the Concept Formation Ability Test was administered to each pupil by the researcher. Permission for use of this test was given by Dr. Jean Braun who developed it to study the concept formation ability of under- and over-achievers at three developmental levels. The Concept Formation Ability Test

consists of twenty class concepts. To form a class concept, the pupil is required to pick out the six exemplars of the class from a series of twenty-four stimulus words and to orally express the class which contains these exemplars.

Analysis of the data indicated that the able readers were more proficient at forming and expressing class concepts than were the disabled readers at the same grade level. The grade six disabled readers exhibited better verbal hierarchical classification than did the grade four disabled readers. A similar directional difference was observed when able readers at the two grade levels were compared. The grade four able readers were more proficient in forming and expressing verbal hierarchical classifications than were the grade six disabled readers.

The findings of this study indicate that there should be a greater emphasis on verbal hierarchical classification and other aspects of concept formation in diagnosis and remediation of learning disabilities. For an effective assessment of concept formation abilities, a wider range of evaluation instruments and procedures need to be developed. The findings also suggest that modifications should be made in instruction for pupils who are observed to have difficulties in concept formation within the classroom setting and also for those who have reading problems. Such modifications could include a variety of classification tasks at both the concrete and verbal level.

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Copies of standardized tests used in this study have been included in the appendices with the permission of the publishers. The Gates-MacGinitie Reading Tests, Survey D, Form 3 is included with the permission of Teachers' College Press, Teachers' College, Columbia University, New York. The Canadian Lorge-Thorndike Intelligence Tests, Levels A to F, Form 1 is included with permission of Thomas Nelson & Sons (Canada) Limited, Don Mills, Ontario.

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CHAPTER I

OVERVIEW OF THE STUDY

INTRODUCTION

Educators generally agree that disabilities in reading can be related to many causative factors and combinations thereof. In diagnosis of reading disabilities, there has been a tendency to assess intelligence and personality and to examine thoroughly the perceptual, emotional, educational, neurological, physical and socio-economic backgrounds of the disabled reader. The analyses result in a diagnostic profile of the disabled reader which in turn forms the basis of the remedial instruction program for that student. Cognitive abilities, including the various dimensions of concept formation ability, tend to receive much less emphasis both in diagnosis and in remedial instruction than do the above-mentioned factors.

A similar degree of emphasis on cognitive abilities and their relation to the reading process is evident in the writings of prominent authorities in the field of reading. Few of the basic texts in reading deal extensively with the area of cognitive abilities and reading, particularly in relation to the situation of the disabled reader. Among those authors who do discuss cognitive abilities and reading, there is general agreement that more research is needed to clarify possible interactions between various cognitive abilities, such as concept formation, and reading ability.

The relationship between concept formation and reading is discussed by Smith and Dechant (1961) who suggest that "differences in

abstracting ability or in the ability to think in categories generally differentiate the superior reader from the poor reader" (p. 38).

In discussing indicators of reading potential, Strang (1964) says:

Concept formation ability has recently been reported as a better predictor of reading potential than intelligence scores. In addition to a test of listening comprehension, a concept formation test would be useful, especially for pupils above the first grade. Different kinds of mental ability are required for success at different grade levels (p. 217).

No indication, however, is given of possible tests or evaluation procedures to be used to assess concept formation ability.

The situation of the backward reader is discussed in detail by Vernon (1960) who theorizes that the disabled reader may possess "some innate cognitive incapacity, magnified and focalized by one or more of a multitude of predisposing factors . . ." (p. 194). She goes on to suggest that:

. . . the essential procedure then is to investigate these children's thought processes, both in reading and in other tasks What is required is a study of the ability or inability to analyze various kinds of material into their constituent units in their correct order and arrangement; to generalize the rules of combination of these units; and to re-synthesize them in accordance of these abilities. It must be established whether there is a lack of these abilities (a) in reading only; (b) with linguistic materials generally; or (c) with other, non-linguistic, material (pp. 196-197).

If the psychological nature and basis of reading disability can be established, Vernon (1960) contends, then it should be possible to make remedial instruction more efficient. Remedial programs could be designed or re-oriented to alleviate cognitive disabilities in addition to the disabilities for which remedial instruction is already available.

Johnson and Myklebust (1967) suggest a possible relation between concept formation and verbal facility because it has been observed that

concept formation appears to become more difficult when verbal facility is affected. While a concept can be formed without word usage, the process occurs more readily when "the relevant word is available for its [the concept's] identification. Research evidence concerning the precise manner in which language disorders and concept formation are related is not yet available" (pp. 43-44).

From the statements of these writers, concept formation ability and other cognitive abilities are being recognized increasingly as possible substantial contributors to successful reading. The need for pertinent research in this area is also stressed. While studies of the relationship of the level of concept development and/or concept formation ability are relatively few, significant trends are emerging. Valuable knowledge and promising suggestions for further research in this area have been contributed by studies such as those of Kress (1955), Braun (1961), Jan-Tausch (1962) and Wickens (1963). A review of these studies is presented in the next chapter.

Investigations of the level of concept development and of aspects of concept formation ability in relation to reading achievement pose inherent difficulties in terms of measurement. Various approaches to assessment are being developed or are being adapted from other disciplines such as psychology. Analysis of student responses made on items of vocabulary tests have yielded useful information on the diversity and depth of concepts possessed by students (Feifel & Lorge, 1950; Grant, 1965).

In designing studies of concept development and reading achievement, it is essential to distinguish between the process of concept

formation and the products of the process, namely the concepts that have been developed by the individual. Investigation of any dimension of the process of concept formation in relation to verbal materials necessitates a somewhat different approach from that which can be used to assess level of concept development. In evaluating concept formation ability, one must be aware that there are several aspects to the process and that concepts can be formed in numerous ways. Initial studies of possible relationships between concept formation ability and reading may concentrate on one aspect of the concept formation process and eventually, when adequate evaluative measures are available, studies may be designed which will permit a broad spectrum analysis of concept formation abilities and reading achievement.

A study designed to investigate any aspect of concept formation ability in disabled readers as this ability relates to verbal materials, must take into account not only the problems associated with assessment of concept formation ability but also the difficulties peculiar to the disabled reader. The evaluation procedure or measuring instrument used to assess concept formation ability cannot be based upon reading ability if the assessment of concept formation ability is to avoid reflection of the poorly developed word perception and recognition skills of the disabled reader. In order to investigate concept formation ability as it relates to verbal materials, it is desirable to employ an evaluation approach which has the following characteristics: (1) it involves the pupil in some form of concept formation activity, (2) it is verbal in nature, and (3) it is not dependent upon an advanced level of independent word perception and word recognition abilities. Thus a

researcher interested in concept formation abilities of disabled readers is confronted with the task of finding or developing an evaluation approach which will circumvent the reading problems of the disabled reader while it still yields information on the aspect of concept formation ability to be considered.

PURPOSES OF THE STUDY

The major purpose of this study is to make an exploratory investigation of one aspect of concept formation ability, namely verbal hierarchical classification ability, of male pupils receiving remedial instruction in a clinical reading situation. The Concept Formation Ability Test, involving hierarchical classification of words, was the major instrument used. The test was developed by Braun (1961) for use in her doctoral dissertation. Information relating to this instrument can be found in Chapter III and Appendix A.

Specifically, this study seeks to determine whether the verbal hierarchical classification of the disabled reader differs significantly from that of the able reader at the same grade placement level in school. It further seeks to establish whether there is a significant difference in verbal hierarchical classification between able readers at the fourth and sixth grade levels and between disabled readers at the fourth and sixth grade levels.

HYPOTHESES

The study is designed to investigate the general hypotheses that able readers are more proficient in the ability to form and state verbal

hierarchical class concepts than are disabled readers, and that sixth grade pupils are more proficient in forming and stating verbal hierarchical class concepts than are fourth grade pupils.

The following null hypotheses, based on performance on the Concept Formation Ability Test, were tested:

1. There is no significant difference between fourth grade disabled readers and able readers in verbal hierarchical classification ability.
2. There is no significant difference between the sixth grade disabled readers and able readers in verbal hierarchical classification ability.
3. There is no significant difference between fourth grade disabled readers and sixth grade disabled readers in verbal hierarchical classification ability.
4. There is no significant difference between able readers at the fourth and sixth grade levels in verbal hierarchical classification ability.
5. There is no significant difference in verbal hierarchical classification ability between grade six disabled readers and grade four able readers.
6. There is no significant difference between the disabled readers, as a total group, and the able readers, as a total group, in verbal hierarchical classification ability.

Following is a discussion to clarify the meaning of terms used in this study.

Disabled readers. In this study, the disabled readers were pupils in either grades four or six who have been receiving remedial instruction in a clinical instructional setting. They have average intellectual ability, based on individual assessments of intelligence using the Wechsler Intelligence Scale for Children or the Stanford-Binet Intelligence Test. The pupils have no discernible neurological or physical impairments. They were referred for remedial assistance by school personnel because the reading achievement of the disabled readers, at the time of referral, was two or more years below grade placement and was seriously impairing general academic achievement.

At the time of testing for the study, the instructional reading level of the disabled readers was, on the average, approximately one and a half years below their grade placement level. The instructional level was based on standardized tests and on observations, made by remedial teachers in a clinical instructional setting, of the disabled readers' performance on reading tasks.

Able readers. The able readers were pupils in either grades four or six whose reading achievement was considered to be average or better than average by their teachers and principals. Based on survey tests of intellectual ability administered periodically during the elementary years, they have average intellectual ability. These pupils were chosen by the school personnel on the basis of teacher observation of reading achievement during the year, testing in reading during the

year, and proposed placement for the 1969-70 school term.

Verbal hierarchical classification. The measure of verbal hierarchical classification is the total score, comprised of correct and partially correct classification of words, made by each pupil on the items of the Concept Formation Ability Test. The total score possible on the test is 20 when all classifications are correctly formulated and expressed.

DESIGN OF THE STUDY

A brief description of the sample and testing procedures is included in this section. Each topic is elaborated upon in Chapter III.

Sample

Four groups of male pupils participated in this study. All pupils were in the Elementary Division of the Calgary Public School System.

The two experimental groups of pupils consisted of disabled readers who have been receiving instruction in remedial reading at the Learning Assistance Centre of the Calgary Public School System, this being a centre for the diagnosis and remediation of learning disabilities. There was a total of thirty-one boys in the experimental groups. In the regular school setting during the 1968-69 term, the eighteen disabled readers in one experimental group have been in grade four classes throughout the school system. The thirteen pupils in the other experimental group have been in grade six classes.

The two remaining groups were control groups consisting of able readers in grades four and six who were attending three different elementary schools. There were seventeen boys in the control group consisting of able readers at the grade four level and eighteen grade six boys in the other control group of able readers.

Testing Procedures

To obtain comparable descriptive data on the mental ability and reading ability of all the pupils in the study, the researcher administered the following standardized tests to groups of pupils in the schools and at the Learning Assistance Centre:

1. Canadian Lorge-Thorndike Intelligence Tests, Levels A to F, Form 1.
2. Gates-MacGinitie Reading Tests, Survey D, Form 3.

The Concept Formation Ability Test (Appendix A) was administered individually to each student. Responses were recorded and scored by the researcher.

The following data were collected from cumulative records in the schools and from files at the Learning Assistance Centre: (1) date of birth, and (2) number of years in school. Testing and collection of data were completed in May and June, 1969.

The scoring of responses to the Concept Formation Ability Test was done by the researcher and was corroborated by having two independent judges score the pupil responses and by subsequently calculating percentages of agreement.

For description of mental ability and reading ability, the distribution of the following scores was obtained:

1. Verbal and non-verbal intelligence quotients derived from the Canadian Lorge-Thorndike Intelligence Tests.
2. Speed and Accuracy, Vocabulary, and Comprehension scores on the Gates-MacGinitie Reading Tests, Survey D.

Means and standard deviations for these scores were also calculated.

The Mann-Whitney U Test, a non-parametric statistical procedure, was used to investigate the difference in verbal hierarchical classification ability, as measured by the Concept Formation Ability Test, between able readers and disabled readers in grade four and grade six. Analyses were also made of the differences in verbal hierarchical classification ability of able readers and of disabled readers at the two grade levels being considered.

SIGNIFICANCE OF THE STUDY

This study was considered relevant and pertinent to current procedures in diagnosis and remediation of reading disabilities for the following reasons. Firstly, there is limited emphasis on aspects of concept formation ability in the diagnosis of remediation of reading disabilities. Secondly, results of remedial instruction being carried on with disabled readers indicate possible impairments of cognitive functioning. The disabled readers appear to have extreme difficulty in areas such as generalization and classification in relation to both

the mechanics of reading and the ideational content of printed materials. Differences between disabled readers and able readers in aspects of concept formation ability, such as verbal hierarchical classification, would suggest that remedial reading instruction should be expanded and re-oriented to alleviate deficiencies in cognitive development. Thirdly, there are few instruments specifically designed for assessment of concept formation abilities as they relate to verbal and printed materials. The Concept Formation Ability Test being used in this study may provide useful information to supplement that which is derived from an extensive battery of tests currently used in clinical reading situations.

Knowledge of poorly developed verbal hierarchical classification among disabled readers can serve as an impetus to the construction and utilization, in the remedial program, of activities specifically designed to develop classification abilities. Such knowledge also could be useful in setting guidelines for those who are assisting the disabled reader.

ORGANIZATION OF THE THESIS

The remainder of the study is organized as follows:

Chapter II: Related Literature. This chapter includes a review of literature relevant to concept formation, an overview of hierarchical classification, the use of hierarchical classifications in cognitive development research and a review of studies of classificatory behavior in children.

Chapter III: The Plan of the Study. This chapter describes the

sample of pupils selected for participation in the study, the standardized survey tests administered, and the Concept Formation Ability Test. The findings of the pilot study, the collection and analysis of the data, and the reliability of the scoring of pupil responses are presented.

Chapter IV: The Findings of the Study. This chapter presents the pupil achievement on the standardized survey tests. The findings of the study with respect to the hypotheses are described.

Chapter V: Summary, Conclusions, Implications, and Suggestions for Further Research. This chapter provides a summary of the study, the main findings, and the conclusions based on these findings. The implications of the findings for educational practice are discussed and suggestions for further research are provided.

SUMMARY

This chapter has provided an overview of the study. Authorities in the field of reading are recognizing level of concept development and concept formation ability as possible substantial contributors to success in reading. They agree on the need for research to explore the nature of the relationship between cognitive abilities and reading abilities. This study was concerned with investigation of one aspect of concept formation ability, namely verbal hierarchical classification, of disabled readers.

CHAPTER II

RELATED LITERATURE

INTRODUCTION

The review of literature relevant to the present study has been divided into four sections. To provide a general background for the present study, section one contains a brief discussion of concept formation and deals with the following areas: the process of concept formation, characteristics of concepts, factors affecting concept formation, value of concept formation, types of concepts developed by children, and the developmental nature of concept formation.

A general statement of hierarchical classification is presented in section two as a general framework for the discussion, in section three, of the use of hierarchical classification in research on cognitive development.

Since the present study is concerned with investigating hierarchical classification ability in disabled and able readers at the elementary school level, the research studies reviewed in section four are basically studies of classificatory behavior in children. The studies cited include those dealing with general classification behavior in children and those which relate reading and classification behavior.

CONCEPT FORMATION

In investigating any aspect of concept formation, one needs to be aware not only of the concepts themselves, but also of the processes

which led to their existence. Acquisition of information in this area brings a realization of the profound complexity of concept formation.

The present investigation is concerned with only one aspect of concept formation, namely hierarchical classification, as it relates to pupils who are poor readers. To provide a generalized context for the present study, the following areas are briefly discussed: the process of concept formation, characteristics of concepts, factors affecting concept formation, value of concept formation, types of concepts developed by children, and the developmental nature of concept formation.

The Process of Concept Formation

In introducing an extensive discussion of concepts and concept formation, Vinacke (1952) suggests that a distinction must be made between the processes of concept formation and the concepts that are the consequences of those processes. He indicates that

. . . concept formation involves processes of perception and learning by means of which the individual develops an organized and coherent relation to the external world. The consequence of these processes is the establishment of concepts . . . (p. 98).

In human beings, the process of concept formation initially involves accumulation of experiences from which information is derived. The individual generally imposes some form of organization on the information. The subsequent aspects of the process of concept formation involve labelling, manipulating, and applying of aspects of the organization through the use of symbols. In most instances, these symbols are words.

A concept is structural in nature as it "may be regarded as a kind of selective system in the mental organization of a person which links previous experience and current states with stimulus objects" (Vinacke, 1952, p. 100). The complexity of cognitive structures is enhanced by interrelations among the organized systems.

A key phrase in the previous quotation about concepts is "selective system." The level and diversity of conceptual development of any one individual would have a dynamic role in selection of salient features of the environment to which he would attend and respond. The ongoing thought processes of the individual and the types of responses made would be influenced by the quantitative and qualitative level of conceptual development.

Russell (1956) regards a concept as a generalization about related data with discrimination or differentiation also being involved in the concept. Concepts are symbolized "by a word or phrase or some other sign or symbol" (p. 118).

A somewhat more complex definition is provided by Bruner, Goodnow and Austin (1962) since they regard a concept as

. . . a network of sign-significate inferences by which one goes beyond a set of observed criterial properties exhibited by an object or event to the class identity of the object or event in question, and thence to additional inferences about other unobserved properties of the object or event (p. 244).

Stauffer (1969) says a concept

. . . is a network of inferences that are discriminated and categorized as belonging to the same object or event (class or kind), provides the bases for inferences about other

categories, and is usually represented by a word(s) or other symbol. Concepts may be defined on a subordinate and superordinate basis and classified as a part of a system. In addition, they may be classified as perceptual (concrete) or conceptual (abstract), depending on the source of the attributes being used (p. 379).

Rather than attempt to provide an inclusive definition of the term "concept", Vinacke (1952) presents the following characteristics of concepts:

1. Concepts are not direct sensory data but something resulting from the elaboration, combination, etc., thereof . . .
2. . . . concepts depend upon the previous experience of the organism . . .
3. Concepts are systems within the mental organization which tie together, or link, or combine discrete sensory experience. . .
4. It may be inferred that such ties or links are symbolic in nature: that is, the same concept may be invoked by a variety of stimuli. In the human organism, words usually fulfill this symbolic function . . .
5. On the side of the internal processes of the organism, concepts represent selective factors. An external stimulus arouses a symbolic response, on the one hand, or a symbolic response guides perceptual activity, whichever comes first . . .
6. Concepts . . . have both "extensional," or denotative, and "intensional," or connotative meanings . . .
7. Concepts vary in the "consistency," or correctness of their organization . . .
8. Concepts have both "horizontal" and "vertical" organization . . . (pp. 100-103).

These definitions and characteristics emphasize the systematic and abstract nature of concepts. Concepts essentially are rules for dealing with a class or a series of classes, with these rules being evolved by the individual on the basis of past experience. Concepts that have been acquired tend to exert selective and directive influences on the

relationship of the individual to his environment, thereby partially determining the extent to which he will further benefit from his environment and experiences. In addition, for the human organism, language plays an important role in concepts since words are used in symbolizing the criterial attributes and the relations inherent in conceptual systems.

Factors Affecting Concept Formation

An extensive summary of factors affecting concept formation presented by Russell (1960) includes such factors as the nature of the problem presented, the goal of the learner (including motivation and level of aspiration), and characteristics of the learner including chronological age, mental age, specific experience, ability to participate in inductive and deductive thinking, perceptual facility, and ability to concentrate. Factors external to the learner which may affect concept formation include: materials used as samples, the manner and order of presentation of stimuli, the nature of validation of possible concepts, and the use of the concept when it is derived.

Similar influential factors are included by Thompson (1952), Jersild (1960), and Vinacke (1952) in their discussions of concept formation.

Value of Concept Formation

For the human who must acquire, retain, and utilize a large amount of information in order to function adequately in his environ-

ment, the ability to categorize information has numerous advantages. Bruner, Goodnow and Austin (1962) have advanced the following advantages of categorization:

1. It reduces the complexity of the environment.
2. It is the means by which the objects about us are identified.
3. It reduces the necessity of constant learning.
4. It provides direction for instrumental activity.
5. It permits ordering and relating classes of events and objects.

Categorization abilities clearly have survival value in relation to the environment and, furthermore, these abilities facilitate rational behavior such as "exploring, ordering, creating, and predicting" (Russell, 1956, p. 323). Thus these cognitive abilities not only ensure the survival of the human organism but they also facilitate the intellectual development and diversification of man.

Knowledge about the conceptual development of an individual also has predictive value in relation to academic achievement. Russell (1960) has suggested that clarity and completeness of a child's concepts provide two of the best indicators of his probable success in school.

Types of Concepts Developed by Children

Considerable research has been done to provide information about the types of concepts children tend to have acquired at various age levels. The literature clearly indicates the developmental nature of concept formation and also suggests that the acquisition of a wide

array of concepts is a long and arduous process.

A number of extensive surveys and summaries of research on the conceptual development of children are available (Russell, 1954, 1956, & 1960; Vinacke, 1952 & 1954; Thompson, 1952; and Jersild, 1960). The studies cited in the summaries can be grouped into the following broad categories: mathematical concepts, concepts of time, scientific concepts, social concepts, concepts of self, aesthetic concepts, concepts of humor, and miscellaneous concepts.

The vast array of concepts that children gradually acquire is amply attested to by the number of categories in and the breadth of the above-mentioned summaries. Furthermore, conceptual growth tends to follow an orderly sequence, particularly in the formation of a particular concept. There are also general trends and patterns in the types and exactness of concepts which generally appear at a particular age level. Investigators of concept formation do not always agree about the types and correctness of concepts which can be expected at a particular age but there is sufficient consistency in the sequence and patterns of concept formation to permit prediction and generalization about concept development in children.

It is important to remember, however, that there is a wide variation among children of any specified chronological age in terms of the depth of understanding or completeness of concepts. As has been indicated in an earlier section of this chapter, there are many factors which may affect concept development. It is possible, therefore, that at a particular age, one child could have a complete understanding of

a concept to the point of labelling, manipulating and applying it. Another child of the same age may have only the vague beginnings of the same concept.

The Developmental Nature of Concept Formation

While investigators of concepts and concept formation do not always agree on the specific sequence of concepts formed by children, or the ages at which particular concepts appear, there is general agreement that concept formation involves developmental aspects. Vinacke (1954) succinctly summarizes the progressive nature of concept development in the following statement:

1. Increasing age (signifying accumulation of experience) is the single most important variable in concept formation.
2. Progress in learning concepts is a continuous and cumulative affair, rather than occurring in distinct phases . . .
3. Earlier concept learning provides a preparation for later development . . .
4. Among the most important specific changes which take place with increasing age . . . are the following:
 - a. Progression from simple to complex concepts . . .
 - b. Progression from diffuse to differentiated concepts . . .
 - c. Progression from egocentric to more objective concepts . . .
 - d. Progression from concrete to abstract concepts . . .
 - e. Progression from variable to more stable concepts . . .
 - f. Progression from inconsistent to more consistent and accurate concepts . . .
5. Concept formation involves processes which cannot be inferred from either mental age or vocabulary (pp. 532-533).

Summary of Concept Formation

The acquisition of an array of concepts of sufficient complexity

and diversity to enable the individual to function adequately in his environment is a notable achievement. To comprehend fully what is involved in such achievement, one must be aware not only of the process of concept formation but also of the consequences or end products of the process, namely the concepts themselves. Concepts are selective systems or rules in the mental organization of an individual and are consequences of abstracting and combining environmental information. The process of concept formation is affected by many factors and combinations thereof which may facilitate or impede the concept formation process.

The ability to categorize information permits efficient interaction with the environment. In the case of the school child, well-developed conceptual systems can result in the child deriving maximum benefits from his academic environment or experience.

An overview of the types of concepts developed by children amply attests to the astounding amount of learning and systematization that occurs during the early years of an individual's life. Progress in conceptual development is continuous and cumulative with the child's concepts becoming more complex, differentiated, objective, abstract, stable, consistent, and accurate as he grows.

HIERARCHICAL CLASSIFICATION

Among the paradigms of modern scientific thought, hierarchical classification has existed for many years. It was clearly articulated by Darwin as the basis for systematization of the theory of

evolution and for classification of an extensive body of information concerning animal forms as set forth in The Origin of Species published in 1859. In the intervening years, hierarchical classification has been used to systematize extensive bodies of information and knowledge and has resulted in taxonomies in areas such as zoology, botany, and education.

Within hierarchical classification systems, classes can be defined both by their intension and extension. The intension of a class is that set of properties or criterial attributes which are shared by every member of that class and which distinguish the members from those of another class. The extension of a class is the set of members comprising that class, as defined by its intension. At each increasingly general level of classification within the hierarchical system, the criterial attributes defining the superordinate class become increasingly general. The general nature of these criterial attributes results in loss of some specific information about each of the subordinate classes subsumed within the superordinate classes. At the same time, the construction of subordinate and superordinate classes highlights relationships which subsequently help to provide a framework for retention and assimilation of information.

USE OF HIERARCHICAL CLASSIFICATION IN COGNITIVE DEVELOPMENT RESEARCH

The rapidly accelerating rate of discovery and accumulation of new knowledge at the present time has given rise to profound problems in curriculum development and teaching practices. One of the

fundamental concerns of the educationist and the psychologist is to investigate how the growing child develops the ability to process masses of information and to determine what factors facilitate or impede such development. More knowledge is required about these processes and factors affecting them in order to promote efficient and maximum development of information processing and of concept formation by the child within the school context since this is an integral part of the total cognitive development of the child.

Hierarchical classification, as an integral part of the formation of concepts by the child, has been and is being explored by several investigators in education.

Bruner, Goodnow and Austin (1962) are primarily concerned with the analysis of categorizing behavior, both in children and adults. Their basic concern is "an adequate analytic description of the actual behavior that goes on when a person learns how to use defining cues as a basis for grouping the events of his environment" (p. 23). These investigators are considering three basic types of categories: conjunctive, disjunctive, and relational categories. The conjunctive category is defined by the joint presence of an appropriate value of several attributes. The presence of several appropriate attributes or any constituent thereof defines a disjunctive category while a relational category or concept is defined by a specifiable relationship between defining attributes. Of these three categories, the conjunctive category most clearly resembles hierarchical classification. At the same time, disjunctive categories

could be examples of superordinate classes within which subordinate classes are subsumed in hierarchical classification. Relation concepts are not as amenable to interpretation within a hierarchical system.

Inhelder and Piaget (1964) link increasing competence in hierarchical classification with the age of the child. From their investigations, they suggest that hierarchical classification ability becomes relatively well established between the ages of seven or eight to eleven years.

Hierarchical classification has several distinctive features. The child anticipates classifications and can choose the best classification for an array of elements without resorting to trial-and-error behavior. Criteria of classifications are stable, thereby giving the child considerable flexibility when incorporating new elements into classifications which he has already constructed. At this stage of development, new subdivisions can be created within an existing classification or changes can be made in the criteria defining a class. Increasing use of matrices in classification is made by the child during the later elementary school years. As competence in hierarchical classification increases, general questions on class inclusion can usually be dealt with accurately by the child, although some errors about quantification of inclusion can occur when the questions are related to situations which are not in the child's immediately present environment.

In conjunction with a number of associates, Kagan has been

investigating information processing in the child (Kagan, 1965; Kagan, Rosman, Day, Albert, & Phillips, 1964). Kagan has been concerned with the investigation of initial categorization of relevant information, storage of the coded categorization, and imposition of transformations upon the encoded data which are three sequential operations typically occurring in problem solving. The superior intellectual performance of older, as compared to younger, children is generally related to the greater fund of knowledge available to the former group. Kagan maintains that a dimension which has been neglected in studies of cognitive development is the possible relevancy of differences in rate of information processing as individual differences in the degree of reflection devoted to classification and hypothesis selection may be a substantial factor in the quality of intellectual performance. Hierarchical classification is applicable primarily to the stage of categorization of relevant information within the sequential operations in problem solving. Developmental trends emerging from Kagan's studies suggest that, with age, there is an increase in consideration of alternative solution hypotheses when many alternatives are available simultaneously. On this basis, increasing competence and accuracy in hierarchical classification could be expected as the child grows.

Vygotsky (1962) maintains that development of concept formation ability extends over a period of many years and that genuine concept formation does not occur until the age of puberty. Summarizing his studies and those of his associates, Vygotsky says

[Before the age of puberty] we find certain intellectual formations that perform functions similar to those of the genuine concepts to come. With regard to their composition, structure, and operation, these functional equivalents of concepts stand in the same relationship to true concepts as the embryo to the fully formed organism. To equate the two is to ignore the lengthy developmental process between the earliest and the final stage. (p. 58).

The importance of words in the formation of concepts is stressed by Vygotsky. He views all higher psychic functions as mediated processes with signs being a basic means of mastering and directing these processes. The mediating sign is an indispensable part of the total process. "In concept formation, that sign is the word, which at first plays the role of means in forming a concept and later becomes its symbol" (Vygotsky, 1962, p. 56).

The importance of language in the formation of concepts, particularly hierarchical classifications, is indicated in Vygotsky's summary of his view of the process of concept formation:

. . . a concept is formed, not through the interplay of associations, but through an intellectual operation in which all the elementary mental functions participate in a specific combination. This operation is guided by the use of words as the means of actively centering attention, of abstracting certain traits, synthesizing them, and symbolizing them by a sign. (Vygotsky, 1962, p. 81).

Hierarchical classification, as it relates to concept formation, is an integral part of the research and theoretical positions of each of these writers who are concerned with investigation of cognitive development. For some researchers, such as Inhelder and Piaget, hierarchical classification receives considerable emphasis. While Vygotsky deals extensively with the process of concept formation and

the influence of language on this process, hierarchical classification is seen as an integral part of the total process. For other researchers such as Kagan and Bruner, it has relevance for only part of their research and writing.

STUDIES OF CLASSIFICATION ABILITY IN CHILDREN

The studies reported in this section are investigations of general classification ability in children and of classification ability and reading ability. The former studies deal with the ability to learn or form classifications among children of varying ages. The latter group of studies are related to classification ability exhibited by children of varying levels of reading achievement.

Studies of General Classification Ability

Several studies of children's thinking have been contributed by Welch and Long, working singly and together. One series of studies (Welch, 1940; Welch & Long, 1940a, 1940b) investigates the ability of pre-school and primary school children to learn horizontal and vertical classifications of objects.

Welch and Long (1940a) regard horizontal classification as dynamic in nature because the classifications vary according to environmental conditions. Depending upon the circumstances, for example, a brick may be building materials, a missile, or a piece of furniture (pp. 211-212). By comparison, the vertical process of classification involves hierarchical relationships and is considered

more stable than horizontal classifications because "the relationship between a class and its species is thought of as a fixed and permanent one" (p. 212).

In the studies of learning class concepts (Welch, 1940; Welch & Long, 1940a, 1940b), ability of young children to learn horizontal and vertical class concepts was investigated. The ability to learn horizontal class concepts was assessed by having children of varying ages think of test materials as belonging to different species within classes and to classify the objects by a different name for each of several different situations. For example, a cube was presented to the child in three distinct situations and was designated by a different nonsense syllable in each of the contexts. The tasks designed to study learning of vertical class concepts required the child to learn the names of objects and the first-hierarchy class which included those objects. The child was also to learn a second-hierarchy class in which two first-hierarchy classes were included.

The findings of this series of studies indicate that young children found it easier to learn to identify objects in several different contexts than to learn a first-hierarchy structure of two objects and their class or a second-hierarchy within which two first-hierarchies were subsumed.

While these studies differ considerably in content and procedure from those of Inhelder and Piaget, the findings indicate that there is increasing proficiency in learning class concepts

with increased age. The developmental trend observed by Inhelder and Piaget is also seen in the studies by Welch and Long.

Thompson (1941) studied the classification behavior of school age children. A series of sorting tests was used to study the characteristic classification behavior and the verbalizations of reasons for classifications, of elementary school children. The following classification tests were used: (1) the Weigl Test, (2) the B R L Test, and (3) the Vigotsky* Test. In these tests each pupil sorted materials into classes of objects and gave reasons for their classifications. In some subtests, the examiner did the sorting and the child was to give the reason or sorting principle.

For purposes of analysis and discussion, Thompson divided the children into two groups. The older pupils were in grades four through six and the younger pupils were in grades one through three.

Few children in the study could do the Vigotsky Test which requires that attention be directed simultaneously to two aspects of the test materials. All the children tended to be concrete in their classifications, as judged by their performance and verbalizations. Older pupils, however, were more able to grasp categorical similarities or generalities and were more aware of possible relationships. The younger children were considered to be very

*The spelling of the name, Vygotsky, varies among bibliographical sources. Thus both spellings, Vygotsky and Vigotsky, are used in this manuscript.

concrete in their classifications, as indicated by performance and verbalization. When they were able to form coherent groupings of any kind, they tended to group objects according to specific concrete situations. The specificity of classifications was apparent in their verbalizations as these took the form of a story in many instances in contrast to the generalities expressed by the older pupils.

The investigations of Welch and Long and of Thompson indicate that young children have difficulty with hierarchical classification. As suggested by the theoretical position of Inhelder and Piaget, children in grades four through six show increasing proficiency in forming hierarchical classes with recognition of relationships and use of generalizations as organizing principles for the formation of classes.

Sigel (1953) studied developmental trends in the abstraction ability of children. Sixty children, who were in the correct grades for their age and whose percentile ranks on the Raven Test of Progressive Matrices ranged from the 25th to the 75th percentile, were selected as subjects. There were twenty children in each of three age groups; seven, nine and eleven years.

Each child was tested individually with responses being elicited in five test situations, each of which contained 24 familiar toy objects, pictures of these toys, and word names of the toys. The child was asked to group the materials on the basis of similarity.

For scoring purposes, the groupings produced were classified as perceptual, conceptual, and miscellaneous. The groupings designated as perceptual by the examiner included the following: affective groupings based on feeling, groupings based on identity of structure or function, centroid groupings based on belongingness in a geographical area, and functional groupings based on use. A grouping was considered to be conceptual when the objects were treated as members of a class and a class name for the grouping was used by the child. Miscellaneous groupings included those in which conceptual and perceptual classifications were combined, those which were based on a story and those which appeared incorrect in interpretation or in relation to reality. Objects which were intentionally isolated were considered non-groupings and were also classified as being miscellaneous.

The findings of the study indicate a decrease with age in perceptual classification of items. At the same time, the use of conceptual classifications increased steadily with age. When allowed free choice in grouping, the use of miscellaneous categories decreased with age. The same age trend was not seen when the children were specifically asked to reduce the number of groupings they used.

Groupings based on stories were predominant among the responses of the seven-year-old children. The nine-year-old children tended to use conceptual and perceptual classifications equally often. Some use of miscellaneous categories was noted at this level. Conceptual groupings predominated among the responses of the eleven-

year-old children but perceptual categories were used with a frequency similar to that seen among the nine-year-old children.

Under conditions of spontaneous groupings, miscellaneous categories were infrequently used by the eleven-year-old children.

When groupings of objects were made by the experimenter, the children's identifications of the bases of classification revealed essentially the same patterns of thought noted when the children did their own manipulation and classification.

These findings tend to substantiate the position of Inhelder and Piaget on the developmental nature of classification. The seven-year-old children produced groupings which basically were collections of items. Competence in classification increased with age with the eleven-year-old children frequently producing classifications with class names.

The influence of age and cultural background on classification ability was studied by Wei (1966). There were twenty pupils in each of the following groups: culturally-deprived kindergarten children, middle-class kindergarten children, culturally-deprived grade two children, and middle-class grade two children.

The classification tasks were chosen from Piaget's studies and included changing criteria, object classification, class-inclusion, and matrices. In addition to quantitative scoring, a qualitative classification of responses into three stages of development in classification were used to categorize the responses made by the children.

The results of this study indicate that ability to classify increases with age. The culturally-deprived group progresses at a slower rate in classification than do middle-class children. However, two years of schooling appeared to benefit the culturally-deprived group as the difference in classification ability between culturally-deprived and middle-class children was not as pronounced at the grade two level as it was at the kindergarten level.

The findings generally support Piaget's theory of sequence in logical development and of development being related to chronological age. Interaction between the individual and his environment appears to be an important factor in intellectual development. Opportunities for such interaction are often limited in deprived environments and development of proficiency in classification ability may be adversely affected by lack of such opportunities.

Studies of Classification Ability and Reading Ability

The following studies explore differences in classification ability among good and poor readers. The majority of investigations use classification tests which involve manipulation of non-verbal materials. Observation of performance on this type of classification test give indications of how good and poor readers differ in their handling of a concept formation situation requiring the formation of class concepts.

Differences between severely retarded and average readers in ability to form class concepts was investigated by Kress (1955).

Twenty-five pairs of boys between the ages of eight and twelve years were included in the study. All pupils were of average or above average intellectual ability. They were matched on the basis of chronological age, school experience, and intelligence with one member of each pair being a non-reader while his partner was an average reader. The tests used in this study were

(1) Similarities subtest of the Wechsler Intelligence Scale for Children, (2) Verbal Opposites subtest of the Detroit Tests of Learning Aptitude, (3) Goldstein-Scheerer Cube Test, (4) Wisconsin Card Sorting Tests, (5) Weigl-Goldstein-Scheerer Color-Form Sorting Test, (6) Kasanin-Hanfmann Concept Formation Test, and (7) the Gelb-Goldstein-Weigl-Scheerer Object Sorting Test. The materials of the last five tests include blocks, geometric forms, colored materials, or representative objects. The last four tests require the pupil to sort the materials into classes and to verbalize the principle of each sorting. On some subtests, the pupil is to give the principle of a sorting done by the examiner.

The findings of the study indicate a distinct difference in performance of good and poor readers on the concept formation tests which required classification ability. Poor readers exhibited the following characteristics: they lacked versatility and flexibility in handling classification tasks, they showed an elementary dependence upon the obvious physical characteristics of the materials, they lacked adequate labels for common, socially approved concepts, their conceptual functioning appeared to be more concrete and less

abstract than that of good readers, and they lacked adequate concepts for dealing with language, particularly reading.

Braun (1961) developed a concept formation test involving classification of series of words to study the relation of classification ability and reading achievement at the third, fifth and seventh grade levels. Boys in the Oak Park (Michigan Public Schools participated in the study. Overachievers and underachievers in reading together with a comparison group of average readers were selected at each of the three grade levels. All pupils were given the appropriate level of the Gates Reading Tests. Selected subtests of the Wechsler Intelligence Scale for Children were administered to the under- and over-achievers being studied.

As the measure of the ability to form class concepts, Braun developed a test consisting of twenty concepts. For each concept there were six series of four words. These series of words were typed on cards resulting in six cards per concept. On each card there was one word that had something in common with one word on each of the other cards in a set of cards. The pupil was required to give a generalization or classification which would include the six words which were examples of the class concept given on the cards for each concept.

Results of the investigation indicate that concept formation based on classification, as measured by the test developed by the investigator, was more closely related to reading achievement at the fifth and seventh grades than was intelligence. Further

interpretations based on the data include:

1. The handicapped reader (of normal intelligence) represents a special population in concept formation ability and is relatively deficient in this probably independent cognitive process.
2. Certain children apparently reach an asymptote in concept formation ability at the end of the early elementary years that may account for an asymptote in their reading at the end of the primary stages.
3. Continuous growth in reading despite differences in factors found to be necessary for success at different grade levels may be attributable to the possibility that various stages in reading tap correspondingly advanced stages in the concept formation process.
4. Use of intelligence tests as the basis for expectancy seems questionable since the practice is followed with the very children in whom intelligence and reading are least closely related (pp. 71-72).

In discussing the situation of the under-achiever in reading, Braun suggests that what appears to be related to their achievement is their concept formation ability. "We do not know, as yet, if these children are going to continue permanently low in this major cognitive process of concept formation or if they are simply uneven in their development" (1963, p. 681).

Jan-Tausch (1962) studied the concept formation ability of 170 boys and girls in grades four through seven in the public schools of Springfield, New Jersey. At each grade level, half the pupils were boys. Of each sex at each grade level, half were advanced readers and half were retarded readers as measured by California Reading Tests, Form CC of the Elementary series and Form AA of the

Intermediate series. The intelligence quotients of the pupils ranged from 79 to 133, based on the California Short Form Test of Mental Maturity. To assess the ability to form class concepts, the following tests were used: (1) the Color Form Sorting Test and (2) the first six designs of the Cube Test of the Goldstein-Scheerer battery of abstract and concrete thinking tests. Only the performance on the tests was evaluated but verbalization was not excluded though it was not essential.

An over-all comparison of performance of the pupils in the study revealed that good readers were characterized by abstract thinking in the classification tests. In addition, the significance of the relationship between concept attitude and reading achievement tended to become greater in higher grades suggesting the possibility that reading comprehension at higher levels takes on more abstract qualities.

The girls tested tended to behave more abstractly than the boys perhaps indicating why boys have a higher incidence of disability in all phases of language than do girls.

Wickens (1963) investigated the relationship between reading ability and classification ability by analyzing the performance of twenty-five average readers and twenty-five poor readers on a series of classification tests. All the pupils were in grade four and the average and poor readers were compared on the following classification tests: (1) the Raven Coloured Progressive Matrices, (2) Word Grouping and Figure Grouping of the Primary

Mental Abilities Tests, (3) Shure-Wepman Concept Shift Test, and Rapaport's Object Sorting Test. The activities the pupils did in relation to these tests included choosing a geometric design to complete a matrix, selecting a non-exemplar of a category consisting of either words or figures, and sorting representative objects or variously shaped and colored geometric blocks together with giving a reason for each sorting. On some subtests, the pupil was to give the organizing principle basic to a sorting done by the examiner.

On both the manipulative tests and the verbal test, the average readers were significantly more proficient in classification and recognition of classifications than were the poor readers. The good readers also were more proficient than poor readers in verbalizing the organizing principles or bases of categories. Poor readers had particular difficulty in giving the organizing principle of a classification which was done for them by the examiner.

Summary of Studies of Classification Ability

Findings of general investigations of classification ability of young children indicate that proficiency in forming hierarchical classifications increases with age. Pre-school children tend to have considerable difficulty with hierarchical classification. Ability to classify continues to develop throughout the early school years. In grades four through six, children show increas-

ing use of hierarchical classification together with increasing recognition of relationships. At this level, children tend to use generalizations as organizing principles for the formation of classifications.

The studies of classification ability of good and poor readers clearly indicate significant differences in ability to perform classification tasks. There also were significant differences between good and poor readers in the generality or abstractness of concepts that were used in forming classes of objects. The good readers were better able to express the organizing principles of classifications than were poor readers.

Comparing the performance of good and poor readers on classification tasks appears to be a useful approach to acquiring information about aspects of concept formation ability and its possible relation to reading ability. The use of classification tests with non-verbal content has yielded valuable information about the ability to form class concepts. However, since reading is linguistic in nature, further study is needed of classification involving verbal material to obtain a more complete picture of the relationship between the classification aspect of concept formation ability and reading ability.

CHAPTER III

DESIGN OF THE STUDY

INTRODUCTION

The purpose of this chapter is to describe the sample selected for the study, the standardized tests used, the Concept Formation Ability Test, the findings of the pilot study, the collection and analysis of the data, and the reliability of the scoring of pupil responses to the Concept Formation Ability Test.

THE SAMPLE

Administrative officials of the Calgary Public School System granted permission for the researcher to collect data at the Learning Assistance Centre and in three elementary schools.

The disabled readers in the study were attending tutoring sessions at the Learning Assistance Centre. The Learning Assistance Centre began operation in September, 1966, and is a department within the Division of Special Services. It was created to meet the need for remedial instruction required by pupils whose academic achievement is low despite normal intellectual ability and absence of physical or neurological impairments. It has been designed to provide diagnostic and remedial services and to provide selected classroom teachers with two-year periods of in-service training in remedial instruction.

Students are referred to the Learning Assistance Centre by their teachers and principals, by Visiting Teachers, and by school psychologists. Referral information includes a summary of academic

achievement, a statement of current academic status and the results of an individual assessment of intellectual ability. Information on the child's development, family and social relationships and reactions to school is gained from a parent interview prior to diagnosis or treatment of the child. Diagnosis done at the Learning Assistance Centre includes hearing screening and assessment of auditory discrimination done by speech pathologists, visual screening and assessment of social maturity together with in-depth analysis of achievement in areas of the language arts and mathematics. On the basis of the diagnosis, an individual instructional program is recommended for the child. Remedial instruction is carried out by the reading clinicians or by reading tutors who are classroom teachers under the supervision of a clinician. The child may be tutored individually or he may be with one or two other pupils, depending upon the type of program required and upon the child's level of achievement. He attends one hour tutoring sessions twice or three times per week at the Learning Assistance Centre. These sessions are held during the school day and are a part of the disabled reader's total instructional program. The majority of the children attending the Learning Assistance Centre travel by bus with bus tickets supplied by the School Board. In a few instances where the child is quite young or where bus connections are inadequate, the parents drive the child to and from the Learning Assistance Centre.

In June, 1969, approximately 140 elementary and junior high school students were being tutored on a regular basis at the Learning

Assistance Centre. At that time, the staff consisted of six reading clinicians and six reading tutors.

In designing the present study, extensive consideration was given to the problem of how to match disabled readers with able readers in relation to the factors of age, number of years in school, level of reading achievement, intellectual ability and grade level.

Consideration was given to matching disabled readers and able readers on the basis of age and number of years in school. This arrangement would have resulted in the able readers having had quite different school experiences, in terms of exposure to the curriculum and the cognitive demands inherent in the curriculum, because their grade levels would have been one or two grades beyond those of the disabled readers in the majority of cases. This arrangement was considered unsatisfactory because the able readers, who would have been in more advanced grades, would have had the advantage of qualitatively different school experiences as compared to disabled readers of the same age and with the same number of years in school.

Using levels of reading achievement on standardized tests as the basis of matching disabled and able readers would have resulted in widely dissimilar ages, number of years in school, and grade levels between the two groups. The grade placement levels of the able readers would have been considerably below those of the disabled readers and thus, their academic experiential background, in

terms of the school curriculum, would also be different. Perhaps the most critical disadvantage of matching on the basis of reading achievement is that many of the able readers would be below the age of nine years. In terms of theories of development of hierarchical classification, such as that of Piaget and Inhelder, which emphasize age as a major factor in such development, the able readers below the age of nine might have been in the process of acquiring the ability to use hierarchies when classifying. Under these conditions, assessment of hierarchical classification ability in the able readers could reflect the transition to hierarchical classification rather than provide information about relatively well established hierarchical classification ability.

Matching disabled readers and able readers on the basis of intelligence scores was also considered and rejected. Individual intelligence quotients, based on the Wechsler Intelligence Scale for Children or the Stanford-Binet Intelligence Tests, were available for the disabled readers. Comparable data on individual intelligence quotients were not available for able readers nor could these be obtained within the scope of the testing program for the present study. Because survey tests of intelligence usually require relatively well developed independent word perception and word recognition skills, they do not always accurately reflect the intellectual abilities of the disabled reader and usually result in intelligence quotients which are considerably lower than those of able readers of the same age or which are lower than those which are obtained from

an individual intelligence test administered to the same pupil. Matching based on intelligence quotients obtained from survey tests of intelligence could have resulted in disabled readers being matched with retarded children in some instances.

It was decided to base the groups of disabled readers and able readers on grade placement level. On this basis, the disabled and able readers at the fourth grade level would have had essentially the same academic experiential background, in terms of exposure to the school curriculum. The same would hold true for disabled and able readers at the grade six level. All the pupils should have relatively well established hierarchical classification ability, according to theories of development of hierarchical classification which emphasize the age factor. On this basis, it was possible to investigate differences in the ability to form class concepts between disabled readers and able readers at the same grade level. Both grade four and grade six pupils were used in order to determine whether increasing proficiency in formation of class concepts occurs among both disabled and able readers. The present study was primarily concerned with exploration of verbal hierarchical classification ability among disabled readers as compared to able readers at the same grade level. For descriptive purposes only, it was decided to obtain and include data on age, number of years in school, reading ability, and intellectual ability of each pupil in the study.

The disabled readers who participated in the present study

were attending tutoring sessions on a regular basis at the Learning Assistance Centre. For the reasons previously outlined, the study was restricted to disabled readers who were in either grade four or grade six in the regular school setting. Disabled readers were selected whose average instructional reading levels, on the basis of previously administered standardized tests and on the basis of observations of their performance on reading tasks made by their tutors, were approximately one and a half years below their grade placement. Since the majority of pupils at the Learning Assistance Centre were boys, it was decided to limit the groups to male pupils. In subsequent discussion, the two groups of disabled readers are referred to as grade four disabled readers and grade six disabled readers.

The pupils for the control groups of able readers were chosen from grade four and grade six classes in three medium-size elementary schools. There were two or more classrooms at each of these grade levels in the schools assigned to the researcher. The teachers and principals were asked to provide students who were of average intellectual ability, based on the survey tests of intelligence administered periodically during the elementary school years, and who were average or better in reading. On the basis of teacher judgment, testing during the year, and proposed placement for the 1969-70 school term, six pupils at each grade level were provided for testing in each school. Initially, there were eighteen pupils in each of the groups of able readers at the two grade levels.

One grade four pupil became ill during the course of the testing program and he was subsequently dropped from the group as complete test data could not be obtained from him. Since the experimental groups of disabled readers consisted of boys only, the control groups were similarly limited. In subsequent discussion, the control groups are referred to as grade four able readers and grade six able readers.

Table I presents a brief description of the sample in terms of number in each group, number of years spent in school, and chronological age. The pupils in the groups of disabled readers had been in school considerably longer than the able readers at the corresponding grade level. The pupils in the groups of able readers were generally younger than those in the groups of disabled readers.

Tables II and III give the distribution of pupils on the basis of number of years in school and on the basis of age. Inspection of Table II indicates that grade four disabled readers had spent from four to seven years in school while the grade four able readers had been in school for four years. Similarly the grade six disabled readers had been in school for six to eight years while the grade six able readers had had five or six years of schooling. Table III indicates a considerable range in age among the pupils in both groups of disabled readers. On the whole, the grade four disabled readers tended to be older, with ages occurring within a wider range, than the grade four able readers. A similar pattern was seen for disabled and able readers in grade six.

TABLE I
DESCRIPTION OF POPULATION SAMPLE

Test Group	No. of pupils	Average no. of years in school	Average chronological age in months
Grade Four Disabled Readers	18	5.4	134.5
Grade Four Able Readers	17	4.0	119.2
Grade Six Disabled Readers	13	7.4	159.5
Grade Six Able Readers	18	5.9	149.4

TABLE II
DISTRIBUTION OF PUPILS ON THE BASIS
OF NUMBER OF YEARS IN SCHOOL

No. of years in school	Grade Four Disabled Readers	Grade Four Able Readers	Grade Six Disabled Readers	Grade Six Able Readers
8			8	
7	1		2	
6	7		3	16
5	7			2
4	3	17		
Total number of pupils	18	17	13	18

TABLE III

DISTRIBUTION OF PUPILS ON THE BASIS OF AGE

Age in months	Grade Four Disabled Readers	Grade Four Able Readers	Grade Six Disabled Readers	Grade Six Able Readers
171 - 175			1	
166 - 170			4	
161 - 165			3	
156 - 160			2	
151 - 155	1		-	
146 - 150	1		2	4
141 - 145	6		2	6
136 - 140	1			6
131 - 135	1			2
126 - 130	4			
121 - 125	2	8		
116 - 120	2	5		
111 - 115		4		
Total number of pupils	18	17	13	18

STANDARDIZED SURVEY TESTS

For descriptive purposes, current information on reading ability, mental ability (verbal and non-verbal), chronological age and number of years in school was required for each pupil in this study. The data on age and school attendance were collected from cumulative records in the school and from the files at the Learning Assistance Centre. The standardized tests listed below were used to obtain data on mental ability and reading ability.

1. The Canadian Lorge-Thorndike Intelligence Tests, Form 1, Levels A to F.

This is a series of tests of abstract intelligence where abstract intelligence is considered to be the ability to work with ideas and the relationships among ideas. The authors have constructed the tests on the basic premise that verbal symbols are used to express most of the abstract ideas dealt with by the school child and the working adult. Thus, verbal symbols were considered an appropriate medium for testing of abstract intelligence (Lorge, Thorndike, Hagen & Wright, 1967, p. 3).

The Verbal Battery consists of five subtests using only verbal items. These subtests are (1) Vocabulary, (2) Verbal Classification, (3) Sentence Completion, (4) Arithmetic Reasoning, and (5) Verbal Analogy.

The items used in the Non-verbal Battery are either pictorial or numerical in nature. The non-verbal subtests are (1) Pictorial Classification, (2) Pictorial Analogy, and (3) Numerical Relationships.

The reviewers who have discussed the Lorge-Thorndike Intelligence Tests suggest that, on the whole, this is among the sounder group instruments available at the present time. The materials have been selected with care in relation to both content and concepts of intelligence, and the standardization is generally considered to be adequate by the reviewers (Buros, 1959, pp. 479-484).

Both alternate forms and odd-even reliabilities are available for the Lorge-Thorndike Intelligence Tests. The coefficients of reliability for all levels, based on alternate forms, are .76 to .85. The coefficients of reliability, based on odd-even items, range from .88 to .94. The reviewers of the tests consider the reliability satisfactory.

Validity of the Lorge-Thorndike Intelligence Tests, based on intercorrelations among the subtests, ranged from .30 to .70. When the verbal and non-verbal batteries are taken as a whole and these two major divisions are correlated (with each correlation being restricted to a single grade), the coefficients of validity range from .54 to .70 (Buros, 1959, pp. 479-484).

Correlations of validity with other, older tests which measure the same thing are not yet available for Canadian pupils. Lorge-Thorndike Intelligence Tests used in the United States correlate quite highly with other measures of intelligence. Correlations of the Verbal Battery with the Stanford-Binet Intelligence Tests and the Verbal Scale of the Wechsler Intelligence Scale for Children "have been reported in the high 70's and low 80's. The Non-verbal

Battery correlated somewhat lower with these tests - in the high 60's and low 70's" (Lorge, Thorndike, Hagen & Wright, 1967, p. 29).

Information on the publisher of the tests and on the development of Canadian norms for the Lorge-Thorndike Intelligence Tests is given in Appendix C, pp. 153-154.

2. The Gates-MacGinitie Reading Tests, Survey D, Form 3.

This test is intended for use in grades four through six and consists of three subtests (1) Speed and Accuracy, (2) Vocabulary, and (3) Comprehension.

The Speed and Accuracy subtest consists of 36 short paragraphs of relatively uniform difficulty. It is designed to provide an objective measure of how rapidly pupils can read with understanding. Each paragraph ends in a question or incomplete statement. The pupil is required to choose the appropriate answer from a series of four words which follow each paragraph.

The Vocabulary subtest contains 50 items to sample the pupil's reading vocabulary. Each test word is followed by five words from which the pupil is to choose the synonym for the test word.

The Comprehension subtest measures the pupil's ability to read prose passages with understanding. It consists of 21 passages in which a total of 52 blank spaces have been introduced. For each blank space the pupil is to choose one of five possible completions to fit the meaning of the whole passage.

The reliability coefficients for the subtests of the Gates-MacGinitie Reading Tests are given in Appendix C, p. 147. There

are reliability coefficients for each of the subtests at each of the grade levels for which Survey D of the tests is designed. The ranges of reliability coefficients over the three grade levels for each of the subtests are:

Vocabulary:	.85 to .87
Comprehension:	.83 to .89
Speed-Number Attempted:	.67 to .75
Speed-Number Correct:	.76 to .80

Information on the publisher of the reading tests and on the standardization and reliability coefficients of the Gates-MacGinitie Reading Tests are given in Appendix C, pp. 145 - 149.

CONCEPT FORMATION ABILITY TEST (APPENDIX A)

The Concept Formation Ability Test is a test of verbal hierarchical ability and was developed by Braun (1961) for use in her doctoral dissertation study. The content of the test and the procedure for administration and scoring are given in Appendix A.

As presently constructed, the Concept Formation Ability Test consists of twenty concepts based on classification of words. There are six groups of four words for each concept. In each of the groups of words, there is one word which is an example of the class concept to be formed and expressed. The task of the pupil is to verbally express the concept he has formed, based on the six words which he must pick out of the series presented for each concept. According to Braun (1961), nearly all the words employed

in the test are in the vocabulary of the pupils in the study (p. 74).

Each of the concepts to be constructed by the child is a hierarchical classification. In each case, the category to be formed is a superordinate class which is defined by one or more criterial attributes and within which all the exemplars may be subsumed. To clarify this point, each of the concepts in the test is analyzed.

Several concepts are based on the recall and consideration of the perceptible, physical characteristics of the objects or substances denoted by the words which are given as exemplars of the concepts. In order to arrive at the concept, the pupil must recall the physical characteristics of the objects named and must then decide which of those characteristics are the criterion or criteria of the category or classification which would subsume all of the exemplars within it.

The categories of color, things that are white, and things made of metal are based on one criterial attribute. However, the complexity of the cognitive task involved in arriving at the appropriate hierarchical class varies greatly among these three concepts. In the case of color, "pink," "purple," "green," "yellow," and "red" are specific examples of the general class. No other information must be considered by the pupil before attention can be focussed on the criterial attribute of color. A much more complex task confronts the pupil in forming the classification, things that are white, based on the items, "milk," "foam," "cotton," "cloud," "snow," and "tooth." The physical contexts in which the

substances named could be found suggest little about their communality. The pupil must then recall and consider the fundamental physical characteristics of size, shape, color, etc., to arrive at the one attribute which all of the exemplars share and which would permit construction of a single class within which all the items could be grouped. An equally difficult cognitive task is posed by the concept, things made of metal. To arrive at the criterial attribute defining the hierarchical class, the pupil must consider the substances out of which the physical objects, denoted by the exemplar words, are made.

The categories of animals, flowers, and plants also depend upon recall and consideration of perceptible, physical characteristics but require that account be taken of several criterial attributes.

In classifying "tiger," "monkey," "zebra," "donkey," "lion," and "giraffe" as animals, the pupil must take into consideration the following characteristics: living objects, hair-coverings, and having four appendages. In addition, the inclusion of the word "donkey" forces the pupil to eliminate habitat as a characteristic as inclusion of this characteristic could lead to hierarchical classes such as wild animals or jungle animals.

To form a class which would include "lily," "aster," "poppy," "rose," "pansy," and "sunflower," consideration might be given to the following characteristics: living objects, green color, having stems and leaves, grow from the ground. However, the exemplar

words also commonly and specifically denote the flowering part of the organisms named, so that while the words might be classified as names for plants, the classification flowers takes account of the specific information conveyed by these words.

"Grass," "evergreen," "strawberry," "tree," "potato," and "bush" are exemplars of the classification, plants. To arrive at the classification, the characteristics which the pupil must consider are: living organisms, green in color, having stems and leaves, and growing from the ground. In this case, the examples are representative of widely divergent sub-classes so that a broad superordinate class is needed if all the exemplars are to be included.

The hierarchical class, parts of the body, includes the exemplars "brain," "nose," "finger," "mouth," "eye," and "ear." To arrive at the criterial attribute of this classification, the pupil must recognize the relationship of the physical parts to the physical whole.

The concepts of sizes and positions are related, in part, to information the pupil has amassed from perceptual experiences. However, construction of the hierarchical classes also depends upon recognition of the descriptive function of the exemplar words. For example, "big," "large," and "little" describe size, while "in," "up," and "last" describe position. Within each of these concepts, the exemplars can be grouped into pairs of opposites. This possible pairing arrangement can interfere with isolation, by the child,

of the criterial attribute which defines the hierarchical class within which all the exemplars can be included.

Several classifications in the Concept Formation Ability Test require an understanding of function or use in order for the child to arrive at the criterial attributes of the class.

To construct the classification, construction worker, the pupil has to understand that the words "painter," "mason," "electrician," "carpenter," "bricklayer," and "plumber" denote a person who does a specialized kind of work. He also has to understand the generalized nature of the work in terms of where it is generally done, namely in construction, if he is to construct a class which will include all the exemplars. Similarly, construction of the class, arts, depends upon recognition by the pupil of the nature and function of the activities denoted by such exemplar words as "sculpture," "dancing," and "photography."

Recognition of specialized functions of the objects denoted by the exemplar words is necessary to determine the criterial attribute of the hierarchical class, musical instruments. To construct the classes, transportation, things that teach, and necessities of life, the child should be aware of the general functions or uses of the objects and substances denoted by the exemplar words. While the transportation classification is defined by a criterial attribute which is a general use of the objects named, the functions which serve as criterial attributes of the classes, things that teach and necessities of life, are even more general.

Perhaps the most abstract of the hierarchical classifications based on an understanding of function is that of expressions of attitude. The exemplars, "criticize," "reward," "punish," "blame," "praise," and "approve" signify patterns of behavior. In order for the child to arrive at the criterial attributes of this class, he must understand that these behavior patterns are reactions to performance or behavior and that they contain elements of judgement or evaluation.

The four remaining hierarchical classes in the Concept Formation Ability Test cannot be readily grouped with those which already have been considered.

The classification geography, based on such words as "mountain," "continent," and "city" requires understanding of part-whole relationships. It also depends on an awareness of the context in which these words, as a group, usually would be applied or used.

The terms "justice," "integrity," "righteousness," "freedom," "equality," and "liberty" are themselves labels for extremely complex and abstract concepts. To arrive at the superordinate class, social ideals, the child must be able to recognize that each of the words stands for an array of behavior patterns which can serve as a model, that the model is appropriate for social groups, and that each of the models is considered desirable and ideal.

To construct the classification, action, there must be an awareness of the generalized nature of "cooking," "skiing," "running," "swinging," "working," and "crying." The child needs to separate

the behavior described by the words from the particular contexts in which each usually occurs. For example, "skiing," "running," and "swinging" might be grouped as sports or leisure time activities. However, these classifications are too narrow to include "cooking," "working," and "crying." Since these last three occur in contexts which are not necessarily common to the first three, the child must then consider the more general characteristics of the exemplars. It is interesting to note that each of the exemplar words for this classification have an -ing ending which could act as an additional clue for children who are aware that verbs often have this inflectional ending.

The class, words of affection, includes the words "honey," "adorable," "sweetheart," "darling," "dear," and "lover." Accurate classification, in this case, depends upon recognition of the function of the exemplar words and of the connotations conveyed by the words as they are commonly used.

In developing and using a concept formation test which used words as stimulus items, there was a possibility that such a test would penalize poor readers. To investigate this possibility, Braun developed a non-verbal concept formation test in which the stimulus items were drawings rather than words. There were twenty concepts in the non-verbal test and they were selected to match the level of difficulty represented by the concepts on the verbal test. The two tests were administered to a randomly selected group of 26 third grade boys. Half the group were given the verbal

test first followed by administration of the non-verbal test. The other half of the group were given the non-verbal test first. The correlation coefficient between the scores on the two tests when the verbal test was given first was .91 and when the verbal test was given second, the correlation was .76. These correlation coefficients suggest that the verbal and non-verbal concept formation tests were measuring the same ability. Furthermore, it was considered that the use of word stimuli should present minimal special difficulty, even for the underachievers in the experimental group.

The Concept Formation Ability Test was chosen as the evaluation instrument for the present study for several reasons. Firstly, it involves the child in the activity of forming a class concept and thus gives some indication of how the child goes about the process. Secondly, the content of the test is verbal in nature in contrast to other available tests in which the content is geometric forms, pictorial materials, blocks, materials of various colors, or representative objects. Since reading is verbal in nature and the present study was concerned with exploring the hierarchical classification ability of children who are disabled readers, the Concept Formation Ability Test was considered more relevant to this study than other tests in which content is non-verbal.

The findings of Grant's study (1965) indicate that the vocabulary of poor readers is significantly different, in terms of quantity and quality, from that of good readers at the same grade

level. The third reason for choosing the Concept Formation Ability Test was that it attempts to circumvent the vocabulary problems of the disabled reader by allowing the examiner to give the meanings of any words the child indicates he does not know. In addition, the words used in the test are, with a few exceptions, well within the vocabulary and experiential backgrounds of the children who were being tested.

The words are read to the pupil during the administration of the test, thereby eliminating the need for well developed word recognition skills. The lack of such skills ordinarily handicaps the disabled reader in testing situations. These features of the test were the fourth reason for choosing it.

The verbalization of classifications formed can be difficult for the disabled reader who often is not able to express ideas easily. Furthermore, it is not unusual for the disabled reader to be reluctant to disclose his lack of knowledge and this trait may prevent him from asking for word meanings. These are limitations of the Concept Formation Ability Test in terms of the tasks the pupil is expected to perform.

The Concept Formation Ability Test is not complicated as it requires classifications of series of single words. If, however, there are significant differences in performance between disabled and able readers on this type of content, then consideration must be given to further exploration of the relationship between classification ability and reading ability using more complex

verbal materials. The abstracting and classification required in relation to ideas embedded in sentences would be an even more exacting task for the disabled reader than is the classification of words in the Concept Formation Ability Test.

PILOT STUDY

Toward the early part of 1969, the researcher designed a pilot study which was conducted during the early part of May. All of the tests to be used in the major study were administered to pupils in the pilot study to establish a routine of test administration which would make the most efficient use of testing time. It was necessary to determine how much time would be required for actual administration of the survey tests and the individually administered Concept Formation Ability Test to facilitate planning of the major study. In addition, the pilot study enabled the researcher to gain familiarity with administration of the Concept Formation Ability Test and to obtain sample responses which could provide practice in scoring.

Subjects. Ten male pupils attending the Learning Assistance Centre were used in the pilot study. They were all in grade five in their regular school classes.

Recommendations. On the basis of the pilot study testing, the most efficient order of presentation of the survey tests was to administer the Verbal Battery of the Canadian Lorge-Thorndike Intelligence Tests followed by the first half of the Gates-MacGinitie

Reading Tests. A minimum of approximately one and a half hours was needed for the first testing session. The Non-Verbal Battery of the Canadian Lorge-Thorndike Intelligence Tests and the Comprehension subtest of the Gates-MacGinitie Reading Tests could be given in the second group testing session which required about one and a quarter to one and a half hours.

The time required for administration of the Concept Formation Ability Test varied according to the responsiveness of the pupils. The average time required was approximately twenty-five minutes.

The responses on the Concept Formation Ability Test made by three of the pupils in the pilot study were tape recorded. The pupils tended to be distracted by the presence of the machine and were unduly anxious despite repeated reassurances that the responses made were confidential. As a consequence it was considered inadvisable to tape record the responses of the disabled readers since they appeared to be inhibited by the presence of the machine. In obtaining responses from control pupils in the elementary schools, it was decided to make use of the tape recorder if the pupil reported previous experience with such machines and if he was not distracted by the presence of the tape recorder. In order to maintain uniformity of written recording of pupil responses, the researcher would transcribe the recordings.

PROCEDURE FOR ADMINISTRATION OF CONCEPT FORMATION ABILITY TEST

On the basis of experiences in the pilot study, the procedure to be followed during the administration of the Concept Formation Ability Test evolved into the following pattern. The pupil entered the examination room, was greeted by the researcher, and was seated at a table. He was told that this was a type of interview situation and he would not be required to do any reading or writing as he would be giving oral answers. Identification data including name, grade, birthdate, and school were elicited at this time. When the tape recorder was used, the pupil was asked if he previously had had his voice recorded and the identification data were then tape recorded and played back to give the child an opportunity to hear himself and to check the quality of recording.

The purpose of the Concept Formation Ability Test was explained in general terms and the task of the pupil was explained, in detail, as outlined in instructions for administration of the test. Each pupil was then given the two sample items, followed by the test items.

The responses obtained from the pupils in the pilot study were scored by the researcher. Since subjective interpretation was required on several items, it was deemed necessary to have independent judges score the responses in addition to the scoring done by the researcher.

DATA COLLECTION

The data were collected by the researcher during May and June, 1969. The standardized tests were administered to groups of pupils during two testing sessions for each group. These tests were administered prior to obtaining responses on the Concept Formation Ability Test and were hand scored by the researcher.

The pupils at the Learning Assistance Centre were tested during the time scheduled for their regular tutoring sessions. Pupils in the groups of able readers were tested during the afternoons of a four or five day period in each elementary school visited.

The Concept Formation Ability Test was administered to each pupil by the researcher. The procedure established as a result of the pilot study was used in the major study. To comply with the time allotted for the testing program, responses made by the control group pupils to the Concept Formation Ability Test were tape recorded and subsequently transcribed by the researcher.

DATA ANALYSIS

For descriptive purposes, means and standard deviations were calculated on the Verbal and Non-verbal Intelligence Quotients derived from the Canadian Lorge-Thorndike Intelligence Tests and on the scores on the subtests of the Gates-MacGinitie Reading Tests. The range of scores was also determined for each group in the study.

The Mann-Whitney U Test was the basic statistical procedure used for analysis of scores on the Concept Formation Ability Test.

Analysis was made of the performance of the following groups of pupils on the Concept Formation Ability Test.

1. Disabled readers and able readers in grade four.
2. Disabled readers and able readers in grade six.
3. Disabled readers in grade four and grade six.
4. Able readers in grade four and grade six.
5. Grade six disabled readers and grade four able readers.
6. Combined groups of disabled readers in comparison to combined groups of able readers.

RELIABILITY OF SCORING OF PUPIL RESPONSES ON THE CONCEPT FORMATION ABILITY TEST

The reliability of the scoring of classifications made by the pupils was established through interjudge agreement. The total number of correct and partially correct responses was scored by two independent judges as well as by the researcher. One of the judges holds a Master of Education degree from the University of Calgary while the other holds a Bachelor of Education degree from the University of Alberta and has completed part of a graduate program in reading. Both have had considerable teaching experience in the elementary grades.

To prepare each judge for her independent scoring of the pupil responses, each was asked to read through the test to gain an

understanding of what was required of the pupils. The judges also read personal communications from Dr. Braun giving suggestions for scoring of responses to items on the test. Each judge was then given the pupil responses to be scored.

Agreements were computed in terms of percentages through the Arrington Formula (Arrington, 1932). The responses in each judge's scoring that agreed with those of the researcher (that is, doubling the agreement) were divided by this total plus the disagreements, that is, the responses dissimilarly classified. The formula is

$$\frac{2 \times \text{agreements}}{2 \times \text{agreements} + \text{disagreements}}$$

The percentages of agreement between each of the independent judges are reported in Table IV. Examination of studies using the Arrington Formula indicates that the percentages of agreement listed in Table IV may be considered satisfactory (Grant, 1965; Voice, 1968).

SUMMARY

The data were collected by the researcher in May and June, 1969. The sample consisted of thirty-one disabled readers receiving remedial instruction at the Learning Assistance Centre and thirty-five able readers attending three elementary schools of the Calgary Public School System. All pupils in the sample were boys and were in either grades four or six.

All tests were administered and scored by the researcher. The Canadian Lorge-Thorndike Intelligence Tests, Levels A to F, Form 1,

TABLE IV

PERCENTAGE OF AGREEMENT BETWEEN RESEARCHER AND INDEPENDENT
JUDGES IN THE SCORING OF PUPIL RESPONSES

Independent Judges	Percentage of Agreement
1* + 2	95.25
1 + 3	89.95
2 + 3	92.07

*Judge No. 1 was the researcher

and the Gates-MacGinitie Reading Tests, Survey D, Form 3, were administered to obtain descriptive data on the mental ability and reading ability of the pupils in the study. The Concept Formation Ability Test was administered individually to each pupil.

Data on chronological age and number of years in school were collected from cumulative records in schools and files at the Learning Assistance Centre. To check the scoring by the researcher of responses to the Concept Formation Ability Test, two independent judges scored the responses and percentages of agreement were calculated using the Arrington formula.

Analysis of the data included calculation of means and standard deviations of the intelligence quotients derived from the Canadian Lorge-Thorndike Intelligence Tests and of the scores from the Gates-MacGinitie Reading Tests. The Mann-Whitney U Test, a non-parametric statistical procedure, was used to analyze the data

CHAPTER IV

FINDINGS OF THE STUDY

INTRODUCTION

The study was designed to test six hypotheses relating to verbal hierarchical classification in disabled readers. Descriptive data on the mental ability and reading ability of disabled and able readers were obtained. The results of this study are presented in this chapter. Discussion of the results, along with recommendations for further research and implications for educational practices, will be found in the final chapter.

MENTAL ABILITY AND READING ABILITY

The present study explored the verbal hierarchical classification of disabled readers who are receiving remedial instruction. For descriptive purposes only, current data were obtained from standardized survey tests on the mental ability and reading ability of each pupil. The results of the standardized tests are presented in this section.

Mental Ability

Data on the mental ability of the pupils were obtained from administration of the Canadian Lorge-Thorndike Intelligence Tests. Verbal and non-verbal intelligence quotients were obtained for each pupil.

Table V presents the distribution of intelligence quotients of disabled and able readers at the grade four and grade six levels. Inspection of Table VI reveals that the intelligence quotients of able readers were much higher than those of disabled readers at both grade levels. The mean non-verbal intelligence scores of the disabled readers were somewhat higher than their mean verbal intelligence quotients.

Reading Ability

Data on the reading ability of all pupils were obtained from administration of the Gates-MacGinitie Reading Tests, Survey D. Four reading subtest scores were obtained for each pupil.

Distribution of percentile scores on the reading subtests for disabled and able readers in grade four are presented in Table VII. Inspection of Table VII indicates a relatively wide distribution of percentile scores on the reading subtests among the grade four able readers. The percentile scores on the reading subtests for the grade four disabled readers tend to be concentrated below the twentieth percentile.

Table VIII presents the distribution of percentile scores of grade six disabled and able readers on the reading subtests. Inspection of Table VII reveals that the percentile scores of the grade six disabled readers tend to be concentrated below the twentieth percentile as were the scores of the grade four disabled readers. There is a wider distribution of percentile scores among

TABLE V

DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF PUPILS

INTELLIGENCE QUOTIENTS ¹	GRADE FOUR DISABLED READERS		GRADE FOUR ABLE READERS		GRADE SIX DISABLED READERS		GRADE SIX ABLE READERS	
	Verbal	Non-Verbal	Verbal	Non-Verbal	Verbal	Non-Verbal	Verbal	Non-Verbal
131 - 135			1	3			4	2
126 - 130			2	3			3	2
121 - 125			5	-			-	3
116 - 120			4	3			1	2
111 - 115			2	5			4	4
106 - 110		1	3	2			4	3
101 - 105		2	3	1			2	2
96 - 100		-		1	2			
91 - 95		3		3	-			
86 - 90	2	3		3	-			
81 - 85	1	4		4	1			
76 - 80	2	3		3	5			
71 - 75	3	2		2	-			
66 - 70	5				3			
61 - 65	4				-			
56 - 60	1				2			
Total number of pupils	18	18	17	17	13	13	18	18

¹The Intelligence Quotients were derived from the Canadian Lorge-Thorndike Intelligence Tests.

TABLE VI

AVERAGE INTELLIGENCE QUOTIENTS OF PUPILS

	GRADE FOUR		GRADE FOUR		GRADE SIX		GRADE SIX	
	DISABLED READERS		ABLE READERS		DISABLED READERS		ABLE READERS	
	Verbal I.Q. ¹	Non-Verbal I.Q.	Verbal I.Q.	Non-Verbal I.Q.	Verbal I.Q.	Non-Verbal I.Q.	Verbal I.Q.	Non-Verbal I.Q.
Mean	71.61	87.56	114.83	114.00	95.92	90.85	118.17	117.1
Standard Deviation	8.648	10.746	7.302	9.062	11.932	8.273	10.966	9.410

¹Intelligence quotients were derived from the Canadian Lorge-Thorndike Intelligence Tests, Levels A to F, Form 1.

TABLE VII

DISTRIBUTION OF PERCENTILE SCORES OF GRADE FOUR PUPILS ON READING SUBTESTS

PERCENTILE RANGE	SPEED ¹		ACCURACY		VOCABULARY		COMPREHENSION	
	Disabled Readers	Able Readers	Disabled Readers	Able Readers	Disabled Readers	Able Readers	Disabled Readers	Able Readers
91 - 100		2		2		6		2
81 - 90		1		3		4		6
71 - 80	1	2		3		2		1
61 - 70	1	4		4		1		4
51 - 60	-	6		3		3		4
41 - 50	-	-		1	1	1		
31 - 40	-	2		1	-		1	
21 - 30	-				3		3	
11 - 20	6		4		5		3	
0 - 10	10		14		9		11	
Total number of pupils	18	17	18	17	18	17	18	17

¹The percentile scores given are for the subtests of the Gates-MacGinitie Reading Tests, Survey D, Form 3.

TABLE VIII

DISTRIBUTION OF PERCENTILE SCORES OF GRADE SIX PUPILS ON READING SUBTESTS

PERCENTILE RANGE	SPEED ¹		ACCURACY		VOCABULARY		COMPREHENSION	
	Disabled Readers	Able Readers	Disabled Readers	Able Readers	Disabled Readers	Able Readers	Disabled Readers	Able Readers
91 - 100	1		1	8		5		3
81 - 90	-	3	-	3	1	7		4
71 - 80	-	6	-	2	-	4		4
61 - 70	-	4	1	2	-	2		4
51 - 60	1	2	-	1	2			3
41 - 50	-	2	-	1	-			
31 - 40	1	-	1	-	1		3	
21 - 30	-	1	1	1	1		3	
11 - 20	3		2		2		1	
0 - 10	7		7		6		6	
Total Number of Pupils	13	18	13	18	13	18	13	18

¹The percentile scores given are for the subtests of the Gates-MacGinitie Reading Tests, Survey D, Form 3.

the grade six disabled readers than was the case for the grade four disabled readers. Further inspection of Table VIII indicates that, on the whole, the percentile scores on the reading subtests made by the grade six able readers tended to be higher than those of the disabled readers.

Table IX contains data on the average scores of disabled and able readers on each of the reading subtests. The mean standard score and percentile score are given for each reading subtest, based on the test data. The authors of the Gates-MacGinitie Reading Tests suggest that to obtain an average percentile score for a group of pupils, the average standard score should be calculated for the group and the corresponding percentile score may then be obtained from a table in the test manual. Thus, percentile scores corresponding to the average standard score on subtests and obtained from the test manual are also presented in Table IX for each group of pupils.

Inspection of Table IX reveals that the mean percentile scores of grade four disabled readers on the reading subtests are considerably lower than the mean percentile scores of able readers at the same grade level. Although the percentile scores obtained from the test manual are higher than the calculated mean percentile scores, the higher level of reading achievement of grade four able readers is also seen in the percentile scores obtained from the test manual.

Further inspection of Table IX reveals much higher mean

TABLE IX

AVERAGE STANDARD AND PERCENTILE SCORES ON READING SUBTESTS

	SPEED ¹			ACCURACY			VOCABULARY			COMPREHENSION		
	Disabled Readers	Able Readers		Disabled Readers	Able Readers		Disabled Readers	Able Readers		Disabled Readers	Able Readers	
GRADE FOUR												
Standard Score												
Mean	37.39	53.88		33.5	56.35		37.28	60.47		36.72	57.59	
S.D.	7.0	5.454		3.934	6.552		5.414	7.341		4.828	5.446	
Percentile Score												
Mean	14.89	62.64		6.4	69.94		13.1	79.65		11.61	74.53	
S.D.	19.416	16.693		4.913	17.383		10.785	17.520		9.405	14.880	
Percentile Score from Test Manual	10	66		5	73		10	86		10	79	
GRADE SIX												
Standard Score												
Mean	38.69	54.61		38.23	59.61		41.0	61.06		38.15	58.22	
S.D.	11.763	4.656		10.721	6.601		8.875	3.979		6.747	4.848	
Percentile Score												
Mean	20.0	66.78		20.08	78.89		24.46	84.56		16.38	76.94	
S.D.	27.869	16.413		27.014	18.818		35.096	8.421		13.568	13.1	
Percentile Score from Test Manual	14	69		12	84		18	86		12	79	

¹Subtests of the Gates-MacGinitie Reading Tests, Survey D, Form 3.

percentile scores on the reading subtests for the grade six able readers than for disabled readers at the same grade level. Percentile scores based on mean standard scores and obtained from the test manual reflect the same difference in reading achievement between grade six disabled and able readers as do the mean percentile scores calculated from the data.

TESTING OF HYPOTHESES

To clarify the procedure for testing of hypotheses, a description is given of the statistical test used in the present study. The hypotheses tested are then presented.

Statistical Procedure

The Mann-Whitney U test was used for analysis of hierarchical classification ability of groups of pupils in the study. The Mann-Whitney U Test can be used to determine whether two independent groups have been drawn from the same population. It is considered to be one of the most powerful nonparametric tests and is a useful alternative to the parametric t test (Siegel, 1956).

To test the null hypothesis that two independent groups are from the same population, an observed value of U is calculated on the basis of test data. When the number in the larger group being tested is larger than eight, tables give critical values of U for one-tailed tests at the following levels of probability: $\alpha = .001$, $\alpha = .01$, $\alpha = .025$, and $\alpha = .05$. In order to reject the null

hypothesis at a specified level of probability, the observed value of U must be less than or equal to the critical value of U given in the tables. When the observed value of U is equal to or less than the critical value of U given in the tables, the null hypothesis is rejected in favor of the alternate hypothesis. This procedure was followed for testing the first five hypotheses in the present study.

When the number in the larger group being tested exceeds twenty, a z score is calculated from the observed value of U . The probability of obtaining the observed value of z on a one-tailed test is given in tables. The z scores were used to test hypothesis six because of the large number of pupils involved.

Tied ranks are frequently found in calculating values of U . When there is a large proportion of tied ranks, particularly between groups, the value of U may be affected. To correct for the effect of tied ranks, a z score can be calculated, involving a correction for such tied ranks. The associated level of probability for the observed z score is available from tables. Since a large proportion of tied ranks was found in the data of the present study, z scores with correction for tied ranks were calculated on the test data related to each hypothesis, in addition to calculating observed values of U .

Hypothesis One

There is no significant difference in verbal hierarchical classification between grade four disabled readers and grade four able readers.

Inspection of Table X reveals that the observed value of U is less than the critical values of U at the specified levels of probability. A significant difference in hierarchical classification exists between the disabled and able readers in grade four. Null hypothesis one is rejected at the .001 level of confidence in favor of the alternate hypothesis that the verbal hierarchical classification of grade four able readers is significantly better than that of grade four disabled readers.

Hypothesis Two

There is no significant difference in verbal hierarchical classification between grade six disabled readers and grade six able readers.

Inspection of Table X indicates that the observed value of U is well below the critical values of U for each of the specified levels of probability. Significant differences in verbal hierarchical classification are indicated between grade six disabled readers and able readers. Null hypothesis two is rejected at the .001 level of confidence in favor of the alternate hypothesis that the verbal hierarchical classification of grade six able readers is significantly better than that of grade six disabled readers.

Corrections for tied ranks were applied to the data used to test hypotheses one and two. Analyses incorporating corrections for tied ranks were made of data relating to hypotheses one and two. Results of these analyses are given in Table XI. Inspection of Table XI reveals that the observed z scores have a low level of

TABLE X

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN DISABLED AND ABLE READERS
AT THE SAME GRADE LEVEL

GROUPS COMPARED	OBSERVED VALUE OF U	CRITICAL VALUE OF U ON ONE-TAILED TEST ¹			
		$\alpha = .001$	$\alpha = .01$	$\alpha = .025$	$\alpha = .05$
Grade Four Disabled Readers and Able Readers	39	61	82	93	102
Grade Six Disabled Readers and Able Readers	7.5	42	59	67	75

¹H₀ is rejected in favor of H₁ if the observed value of U is less than or equal to the critical value of U for a specified level of α .

TABLE XI

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN DISABLED AND ABLE READERS
AT THE SAME GRADE LEVEL WITH CORRECTION FOR TIED RANKS

GROUPS COMPARED	OBSERVED z SCORE	LEVEL OF PROBABILITY ¹
Grade Four Disabled Readers and Able Readers	- 3.77	< .00011
Grade Six Disabled Readers and Able Readers	- 4.41	< .00003

¹The probability values given are for a one-tailed test.

probability of occurrence. These findings corroborate the rejection of null hypotheses one and two at the .001 level of confidence based on observed values of U which were not corrected for tied ranks.

Hypothesis Three

There is no significant difference in verbal hierarchical classification between grade four disabled readers and grade six disabled readers.

Inspection of Table XII reveals that the observed value of U is less than the critical values of U at two of the specified levels of probability. These findings indicate that the verbal hierarchical classification of grade six disabled readers is better than that of grade four disabled readers. Null hypothesis three is rejected at the .025 level of confidence in favor of the alternate hypothesis that the verbal hierarchical classification of grade six disabled readers is better than that of grade four disabled readers.

Hypothesis Four

There is no significant difference in verbal hierarchical classification between grade four able readers and grade six able readers.

The observed value of U given in Table XII for able readers at the grade four and grade six levels is less than the critical values of U at three of the specified levels of probability. The null hypothesis is rejected at the .01 level of confidence in favor of the alternate hypothesis that the verbal hierarchical classifi-

TABLE XII

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN DISABLED READERS
AND ABLE READERS AT DIFFERENT GRADE LEVELS

	OBSERVED VALUE OF U	CRITICAL VALUE OF U ON ONE-TAILED TEST ¹			
		$\alpha = .001$	$\alpha = .01$	$\alpha = .025$	$\alpha = .05$
Grade Four Disabled Readers and Grade Six Disabled Readers	59.5	42 (ns)	59 (ns)	67	75
Grade Four Able Readers and Grade Six Able Readers	77.5	61 (ns)	82	93	102

¹ H_0 is rejected in favor of H_1 if the observed value of U is less than or equal to the critical value of U at a specified level of α .

cation of grade six able readers is better than that of the grade four able readers.

Corrections for tied ranks were applied to the data used to test hypotheses three and four. The results of the analyses, with corrections for tied ranks, of data relating to hypotheses three and four are given in Table XIII. Inspection of Table XIII generally confirms the rejection of null hypotheses three and four. The effect of tied ranks is seen in relation to hypothesis three concerning the hierarchical classification of grade four disabled readers and grade six disabled readers. The level of probability associated with the observed z score which has been corrected for tied ranks permits rejection of hypothesis three at the .01 level of confidence as compared to rejection of that hypothesis at the .025 level of confidence based on an observed U score which contained no correction for tied ranks.

Further inspection of Table XIII confirms rejection of null hypothesis four since the level of probability associated with the observed z score is below the .01 level of probability.

Hypothesis Five

There is no significant difference in verbal hierarchical classification between grade four able readers and grade six disabled readers.

Inspection of Table XIV reveals that the observed value of U is less than the critical value of U at two of the specified levels of probability. There is a significant difference between

TABLE XIII

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN DISABLED READERS AND ABLE
READERS AT DIFFERENT GRADE LEVELS WITH CORRECTION FOR TIED RANKS

GROUPS COMPARED	OBSERVED z SCORE	LEVEL OF PROBABILITY ¹
Grade Four Disabled Readers and Grade Six Disabled Readers	- 2.34	.0096
Grade Four Able Readers and Grade Six Able Readers	- 2.50	.0062

¹ The probability values given are for a one-tailed test.

TABLE XIV

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN GRADE SIX
DISABLED READERS AND GRADE FOUR ABLE READERS

GROUPS COMPARED	OBSERVED VALUE OF U	CRITICAL VALUE OF U ON ONE-TAILED TEST ¹			
		$\alpha = .00.$	$\alpha = .01$	$\alpha = .025$	$\alpha = .05$
Grade Four Able Readers and Grade Six Disabled Readers	57.5	38 (ns)	55 (ns)	63	70

¹H₀ is rejected in favor of H₁ if the observed value of U is less than or equal to the critical value of U at a specified level of α .

grade four able readers and grade six disabled readers in the ability to form class concepts based on groups of words. The null hypothesis is rejected at the .025 level of confidence in favor of the alternate hypothesis that the verbal hierarchical classification of grade four able readers is better than that of grade six disabled readers.

Analysis incorporating corrections for tied ranks was made of data pertaining to hypothesis five. Results of this analysis given in Table XV reveal the effect of tied ranks. The level of probability associated with the observed z score permits rejection of null hypothesis five at the .013 level of confidence as compared to rejection of that hypothesis at the .025 level of confidence based on an observed U score which was not corrected for tied ranks.

Hypothesis Six

There is no significant difference in verbal hierarchical classification between disabled readers, as a total group, and able readers, as a total group.

Data relating to hypothesis six are presented in Table XVI. The observed z score for disabled readers as a total group and able readers as a total group has a level of probability less than .00003. The observed z score, corrected for tied ranks, has a similar level of probability. These findings permit rejection of null hypothesis six at the .001 level of confidence together with acceptance of the alternate hypothesis that the verbal hierarchical classification of able readers, as a total group, is significantly

TABLE XV

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN GRADE SIX DISABLED READERS
AND GRADE FOUR ABLE READERS WITH CORRECTION FOR TIED RANKS

GROUPS COMPARED	OBSERVED z SCORE	LEVEL OF PROBABILITY ¹
Grade Four Able Readers and Grade Six Disabled Readers	- 2.23	.0129

¹ The probability values given are for a one-tailed test.

TABLE XVI

ANALYSIS OF HIERARCHICAL CLASSIFICATION IN DISABLED READERS
(TOTAL GROUP) AND ABLE READERS (TOTAL GROUP)

TYPE OF z SCORE	OBSERVED VALUE OF z SCORE	LEVEL OF PROBABILITY ¹
z Score Based on Data	- 5.62	<.00003
z Score Corrected for Tied Ranks	- 5.63	<.00003

¹The probability values given are for a one-tailed test.

better than that of disabled readers, as a total group.

SUMMARY

The present study was designed to explore the verbal hierarchical classification of disabled readers. To describe the sample populations, data from standardized survey tests were obtained on the mental ability and reading ability of each pupil.

The distributions of verbal and non-verbal intelligence quotients together with the mean and standard deviation of each of these sets of scores were presented in the findings. The verbal and non-verbal intelligence scores of the able readers were considerably higher than those of disabled readers at the same grade level. The non-verbal intelligence quotients of the disabled readers were slightly higher than their verbal intelligence quotients.

The distribution of percentile scores on the reading subtests were presented together with the mean and standard deviation for each set of scores. The percentile scores of the disabled readers tended to be concentrated below the twentieth percentile. The majority of the percentile scores obtained by the able readers on the reading subtests were above the 50th percentile and tended to be normally distributed over the 50th to 90th percentile range. The percentile scores representing the mean for each group of pupils on the reading subtests were much lower for disabled readers than for able readers at the same grade level. With the exception

of the Accuracy subtest, the pattern of percentile scores, represented by the means on the reading subtests, was essentially the same for able readers at the two grade levels being considered.

The Mann-Whitney U Test, a nonparametric statistical procedure, was used to test six hypotheses related to the verbal hierarchical classification of disabled and able readers. Calculations to correct for the effect of tied ranks were also made on the data relating to each hypothesis.

Each null hypothesis was rejected in favor of the alternate hypothesis. The verbal hierarchical classification of able readers was significantly better than that of disabled readers at both the grade four and grade six levels. The verbal hierarchical classification of grade six able readers was significantly better than that of grade four able readers. A similar directional difference was seen between the disabled readers at the two grade levels. The grade four able readers exhibited better verbal hierarchical classification than did the grade six disabled readers. Taken as a total group, the able readers exhibited better verbal hierarchical classification than did the total group of disabled readers.

CHAPTER V

CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

INTRODUCTION

The major purpose of this study was to test six hypotheses related to the verbal hierarchical classification of disabled and able readers at the grade four and grade six level. The hierarchical classification of the pupils was assessed through their performance on a test requiring formation and expression of class concepts based on groups of words. The hypotheses involved comparison of hierarchical classification of disabled readers and able readers at the same grade level and as total groups without consideration of grade level. Two hypotheses were tested to compare the hierarchical classification of disabled readers and of able readers at the two grade levels being considered. In addition, the hierarchical classification of grade six disabled readers was compared with that of grade four able readers.

Findings indicated that the verbal hierarchical classification of able readers was better than that of disabled readers at the same grade level. A directional difference favoring the pupils in the upper grade levels was found when comparing the hierarchical classification of disabled readers or able readers at two different grade levels. The grade four able readers had better hierarchical classification than did the grade six disabled readers.

These findings and their educational implications together with recommendations for further research are presented in this chapter.

LIMITATIONS

The findings of this study need to be viewed in the light of certain limitations:

1. The classification responses on the Concept Formation Ability Test were elicited in an interview situation and are, therefore, limited to that context. The formation of a hierarchical classification and the subsequent verbalization of it is a highly complex process. The pupils, particularly the disabled readers, may have been limited by their verbal expressive abilities.

2. The scoring of responses on the Concept Formation Ability Test required subjective interpretation when the quality of responses was being evaluated by the scorer.

3. The number of pupils involved in the present study was relatively small and involved boys only.

4. Each classification task in this study was formation of a class which included six stimulus words. Accurate classification depended, in part, on knowledge of word meaning. Though the pupils were encouraged to ask the examiner for word meanings, some may have been reluctant to do so.

5. Accurate and comparable assessments of the intellectual ability of all the pupils was beyond the scope of the present study. Survey tests of intelligence do not accurately reflect intellectual abilities of disabled readers because these pupils do not have adequate word recognition skills needed for reading questions on the

survey tests of intelligence. While scores based on individual intelligence tests were available for the disabled readers, similar data were not available nor could they be obtained for the able readers.

SUMMARY OF MAIN FINDINGS AND CONCLUSIONS

There were significant differences between the able and disabled readers in the ability to form hierarchical classification concepts, at both the grade four and grade six levels. At the grade four level, the able readers were able to form and express a greater number of class concepts than were the disabled readers. A similar difference was found between the able readers and the disabled readers at the grade six level. These findings indicate that the disabled readers have not developed the ability to form and express class concepts to the same degree that able readers at the same grade level have.

The majority of the disabled readers were older than the able readers at the same grade level. On the basis of those theories of development of hierarchical classification ability which stress maturation as a major factor influencing such development, one might expect that the disabled readers would exhibit well developed classification ability. Indeed, on the basis of age alone, the disabled readers should have been at least as proficient as or better than the able readers at the same grade level in the formation of hierarchical classification. The disabled readers in

the present study have not been able to maximize the possible benefit of age as it is related to development of hierarchical classification ability.

The disabled readers also do not appear to have been able to take full advantage of opportunities for development of various cognitive abilities, in terms of such opportunities being inherent in the school curricula. The disabled readers have been exposed to essentially the same curricula as have the able readers at the same grade level. In many instances, this exposure has occurred over a longer period of time for the disabled readers than for the able readers since many of the former have been in school for a greater number of years than have the latter. Despite the advantages which could have accrued to the disabled readers because of this lengthy exposure to curricula, the verbal hierarchical classification of the disabled readers has not developed to the same level of proficiency observed among the able readers.

The disabled readers appear to have been unable to capitalize on the advantages of either age or school experience in developing verbal hierarchical classification.

The verbal hierarchical classification of grade four disabled readers was compared with that of grade six disabled readers. A similar comparison was made for able readers at the two grade levels. Formation and expression of hierarchical class concepts was better among the grade six disabled readers than among the grade four disabled readers. Similarly, the able readers in grade

six formed and expressed a greater number of class concepts than did the grade four able readers.

The directional difference favoring both the disabled readers and the able readers at the grade six level was expected in view of the influence of age on the development of hierarchical classification. In addition, the grade six pupils have been exposed to school curricula designed for grades one through six while the grade four pupils have had experiences relating to only the first four years of the elementary school program. The experiences and cognitive demands inherent in the curriculum between grades four and six also may have contributed to the greater degree of proficiency in hierarchical classification exhibited by the grade six pupils as compared to the grade four pupils.

A significant difference in verbal hierarchical classification was found when the grade six disabled readers and the grade four able readers were compared. The grade four able readers were more proficient in forming and expressing class concepts than were the grade six disabled readers. The grade six disabled readers had the advantages of age and additional school experiences as compared to the grade four able readers but they appear to have been unable to capitalize on these advantages.

Braun (1961) found indications that some children appear to reach an asymptote in concept formation at the end of the early elementary years which she thought might account for an asymptote in their reading at the end of the primary years. The superior

performance of the grade four able readers compared to the grade six disabled readers in the present study also indicates such an asymptote in hierarchical classification among disabled readers.

At the present time, it is not possible to state the precise nature of the relationship between reading disability and a slow rate of development in aspects of concept formation ability such as hierarchical classification. The lack of adequate development in the area of concept formation ability may be a causative factor in reading disability. Conversely, reading disability may retard development of concept formation abilities since information which is needed by the child for formation of concepts and which normally might be acquired through reading is not available to the disabled reader to the same extent that it is to the able reader.

The findings of this study suggest that reading disability and poorly developed concept formation abilities co-exist as patterns of performance in the child categorized as a disabled reader. While these patterns of performance may be causally linked to each other, it also seems possible that they could both be caused by other factors or combinations of factors including perceptual and conceptual style, personality factors, and general language development.

There was a significant difference in verbal hierarchical classification between the disabled readers, as a total group, and the able readers as a total group. The latter exhibited a greater degree of proficiency in forming and expressing class concepts.

The difference in verbal hierarchical classification found by comparing the total group of disabled readers with the total group of able readers reflected the differences established by comparing the disabled readers and able readers at the grade four level and at the grade six level.

EDUCATIONAL IMPLICATIONS

The findings of this study have relevance to two major areas of education, classroom practice and clinical practice.

At the classroom level, the teachers should be made aware that disabled readers may have difficulties in aspects of concept formation ability. Pupils whose reading achievement is below their expected level but who are not reading disability cases may have similar concept formation difficulties. Confirmation of this will not be possible until evaluation methods have been developed which can be easily and effectively used by the classroom teacher. However, observations of pupil performance on activities requiring aspects of concept formation, such as classification ability, can give the teacher indications of possible concept formation difficulties among her less able readers. Modifications in instructional methods and materials for these pupils should include activities requiring and emphasizing concept formation, particularly if observation of pupil performance suggests difficulties in this area. At the concrete level, the pupil might be given a box or bag of diverse objects and be asked to classify them. After

he expresses the bases of his initial classifications, the pupil might then be required to create alternate classifications. At the verbal level, sets of ten, twenty or more words could be presented to the pupil. He could be asked to classify the words and to explain the bases of categorization.

The findings of the present study have relevance to clinical practice, namely in the areas of diagnosis and remediation of reading disabilities. Clinical personnel should take account of the association of difficulties in concept formation with disabilities in reading. In diagnosing the capabilities of the disabled reader, limited exploration is made of proficiency or lack of proficiency in various aspects of cognitive abilities. Perhaps this has been due to lack of suitable tests. At the same time, the clinical reading situation, because of its flexibility in terms of diagnostic procedures, provides an ideal setting within which to develop and refine techniques for assessment of concept formation abilities and of other aspects of cognitive functioning. Consideration should be given to developing testing techniques which can be employed in the clinical setting and to those which classroom teachers could use.

Remedial classes involve very small groups of pupils with an individual instructional program for each pupil. In this context, it is possible to incorporate activities which are designed to emphasize aspects of concept formation ability. A variety of materials and instructional approaches could be tried out and

evaluated in the remedial setting. Information about the most effective procedures could be made available not only to those personnel involved with remediation but also to classroom teachers.

SUGGESTIONS FOR FURTHER RESEARCH

On the basis of the present study, the following areas of research are suggested:

1. There was a wide variation in the age and number of years spent in school among the disabled readers who participated in the present study. Equating disabled readers and able readers on the basis of age could provide further information on the developmental aspects of hierarchical classification ability. This might indicate when differences between able readers and poor readers begin to appear. Such information would be useful as a basis for exploring factors which may contribute to a slowdown in the development of concept formation abilities, such as hierarchical classification.
2. More information is needed about the interrelatedness of disability in reading and lack of proficiency in concept formation ability. An important question to be answered is whether problems in reading precede or follow difficulties in concept formation or whether these difficulties appear simultaneously. Studies to explore these possibilities would likely have to involve primary school children since the onset of the disabled reader's difficulties generally occurs during his early school years.

3. Considerable information is available from the areas of linguistics and sociology concerning the influences the socio-economic and experiential backgrounds have on the development of thinking and language abilities. An analysis of aspects of concept formation ability of disabled readers in relation to these backgrounds might provide useful information about the importance of these factors in the development of concept formation abilities. Such information would be valuable in terms of compensatory education to correct or prevent disabilities.

4. Further investigation of hierarchical classification and concept formation of both male and female readers might be undertaken to provide insights into possible differences in ability to form and express class concepts.

5. The present study has explored one aspect of concept formation ability and has used one evaluation instrument. A useful study could be done employing a battery of classification tests, which might be verbal or non-verbal in nature, to determine which tests or combination of tests provide a comprehensive picture of hierarchical classification.

Other aspects of concept formation ability might also be profitably explored. Development or adaptation of assessment procedures would be necessary for such exploratory studies. Piaget's interview technique might be considered as a useful approach to such studies.

6. A study could be done to determine the effectiveness of

remedial procedures for children who are not proficient in certain concept formation abilities. A variety of instructional materials and methods might be designed and used with subsequent evaluation of their effectiveness.

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APPENDICES

APPENDIX A

CONCEPT FORMATION ABILITY TEST

THE CONCEPT FORMATION ABILITY TEST

The Concept Formation Ability Test was developed by Braun (1961) for use in her doctoral dissertation. The test consists of twenty concepts with six sets of stimulus items for each concept. Each set of stimulus items consists of four words. The concepts and stimulus items are included in this Appendix (pp.117 -120).

Each set of four words is typed in a horizontal line on a 3 by 5 index card. There is a set of six cards for each of the concepts in the test. On each card, there is one word that is an exemplar of the concept being considered. The task of the pupil is to pick out the six exemplars of the concept and to verbally express that concept.

The concepts included in the Concept Formation Ability Test were derived from several sources including the Similarities subtest of the Wechsler Intelligence Scale for Children and from materials developed by Reed (1946).¹

Reed (1946) studied the influence of set in the learning and retention of concepts. In his study, college students were required to learn nonsense syllables to identify concepts. The nonsense syllables and content of each test item are as follows:

¹The sources of concepts were outlined in personal communication between the writer and Dr. Braun.

Name	Content
1. Kun	horn leaf monkey debt
2. Vor	brook leave claim precious
3. Yem	roses suit juice plum
4. Bep	club picnic reaches beet
5. Dax	answer highest airplane red
6. Jik	pine hear speak chalk
7. Yem	fight tablet chair poppy
8. Kun	fame ought tiger saucer
9. Bep	potato careful pasture raised
10. Jik	across oak floor sorry
11. Vor	lover borrow flower point
12. Dax	anywhere green aloud apple
13. Vor	honey idle breaking bread
14. Jik	pencil cedar just crossing
15. Yem	doesn't spread dandelion stuck
16. Bep	crawl turnip pleasant closet
17. Dax	board beast blue butter
18. Kun	line people elephant sound
19. Vor	broken darling load pearl
20. Kun	uncle fried sheep pear
21. Yem	enough hitch lily tangle
22. Jik	break knee maple eyes
23. Dax	building purple believed plus
24. Bep	call o'clock carries spinach
25. Yem	sunflower ditch shade stir
26. Jik	bid know file walnut
27. Vor	barrel sweetheart hurried noisy
28. Bep	coffee pilot clay carrot
29. Dax	bunch brown borrow prince
30. Kun	crowd sail deer string
31. Bep	berry nickel tomato calm
32. Dax	maid arrow lean yellow
33. Jik	because sugar elm meat
34. Kun	horse circle paid scholar
35. Yem	toward leader pansy treated
36. Vor	banana haste dear minutes
37. Dax	orange beat ankle knives
38. Yem	laden daisy disgust cranky
39. Vor	believe cigar owe love
40. Kun	carrying died cow ruler
41. Bep	urn cabbage crown swept
42. Jik	air hour cheat cottonwood

(Reed, 1946, p. 75).

For Braun's study, a number of items from Reed's materials were included in the Concept Formation Ability Test but the nonsense syllables were not used. To make the vocabulary level more suitable for pupils in the elementary and junior high school grades, the Thorndike and Lorge word lists (1944) were used to adjust the level of difficulty of words in the items adapted from Reed (1946).

To provide an appropriate level of vocabulary for concepts derived from other sources, the Thorndike and Lorge lists (1944) were used. Table XVII gives the frequency count of words used in the sets of stimulus words of the final form on the Concept Formation Ability Test. Nearly all of the words employed were in the vocabulary of the pupils studied, according to the Thorndike and Lorge lists.

The concepts were ranked in abstractness by Dr. Charles Solley of the Department of Psychology, Wayne State University. On the basis of this ranking, the concepts were considered to range from second to fifth hierarchy in abstractness.

TABLE XVII

FREQUENCY COUNT OF STIMULUS WORDS OF CONCEPT FORMATION
ABILITY TEST BASED ON THORNDIKE-LORGE LISTS¹

List	Percentage of Stimulus Words
AA, A	67
20 - 49	18
1 - 19	15

¹ After Braun (1961, p. 74).

Directions for Administration

The instructions for the concept test are as follows:

This is a test on concepts. You probably don't know what a concept is - well, it's a fancy word for 'idea.' For example, if I were to say to you 'boxer, German shepherd, collie, French poodle and terrier,' what one idea would tell you about all of them? That's right, it would be 'dog,' wouldn't it? In this test I'm going to read you a lot of words on some cards and there is one word on each card that has something in common or has the same idea as one word on each of the other cards. When I'm through reading them, I want you to tell me what idea or concept there is on all of these cards. Now, suppose I read these cards to you and on one card there is a man, another there's a woman, another there's a boy, another there's a girl; what idea is there on all of the cards? That's right, it's people; they're all people. All right, you listen to these and see what idea is on all of these cards.

The words are read aloud to the child, one card at a time, while the child also has an opportunity to look at the words along with the examiner. If at the end of three readings of the first group of cards the child cannot name the concept, the examiner spreads all of the cards out on the table and says, "On this one there's a donkey, this one has a lion and this one has a tiger. This one has a giraffe. What idea tells you about all of the ?" If the child still cannot answer, the examiner says, "They're all animals, aren't they?" The second concept is presented in the same way and the same procedure is followed if the child fails. The same procedure is followed with the third concept. If, by the end of the third concept, the child still is unable to grasp the task, the test is to be terminated. If the child succeeds on any of the first

three concepts, the test is continued until he fails three consecutive items.

Scoring of Responses

Although there are certain "right" responses for each item, as is shown by the list of concepts and stimulus items (pp. 125-128), every effort should be made not to penalize the child for verbal inexactness. On the concept "size", for example, the child should be given credit for saying that the concept was "Tells how big you are", "Tells how high", or even "Tells if you're big or not".

Further suggestions for scoring of responses on the Concept Formation Ability Test are given in Table XVIII.

TABLE XVIII

EXAMPLES OF SCORING OF RESPONSES ON THE
CONCEPT FORMATION ABILITY TEST

Concept	Pupil Response	Score ¹
Construction Worker	Different kinds of jobs.	1 credit
Arts	Hobbies.	1 credit
	Things people do for fun.	1 credit
Transportation	Toy (with examples given).	1 credit
Plants	Things that are outside	$\frac{1}{2}$ credit
Construction Worker	Naming of painter, mason, electrician, etc., but no indication of what they have in common.	No credit
Plants	Naming of plants but giving no indication of the concept.	No credit

¹ The scores given for these responses were contained in personal communications to the researcher from Dr. Braun.

CONCEPT FORMATION ABILITY TEST ITEMS

<u>Concept</u>	<u>Stimulus Items</u>
Animal	read party tiger pearls book monkey snow outside paper leap teeth zebra summer donkey shoe roof lion floor music couch picture laugh silly giraffe
Flower	enough hitch lily tangle dust spread aster stuck fight tablet chair poppy rose suit juice plum toward leader pansy treated sunflower ditch shade stir
Color	pine window child pink pasture purple hurt game fight chair green pencil blue answer high corn cup pleasant yellow question leaf tall cow red
Construction Worker	because sugar painter mean bid know file mason break knee electrician eyes pencil carpenter just crossing across bricklayer floor sorry plumber hear speak chalk
Musical Instruments	closet whiskers tuba nice board beast stop piccolo piano beet picnic hear wag flute wish tickle line dark drum bed violin spread lady sleep
Sizes	answer highest airplane small bunch big borrow prince maid arrow lean little large anywhere aloud apple building enormous believed plus board beast tiny butter

CONCEPT FORMATION ABILITY TEST ITEMS (continued)

<u>Concept</u>	<u>Stimulus Items</u>
Parts of the body	distance brain family ghost cannon nose rubber sew anchor engine bound finger mouth corner armor brick erase eye rod shower radio somebody ear light
Transportation	stick bicycle toy river boat peach dish sour just cross train live car suit juice club wax lazy bread airplane tree wagon girl cry
Words of Action	eye adult cooking meadow skiing winter diamonds ceiling running lake magazine leg frown swinging hail club portrait wood working crew oar sweet plate crying
Words of Affection	house warm honey dairy oats adorable table store sweetheart bridge rose smile brook violet darling plum aloud ocean money dear play lover slip talk
Plants	call clock carries grass evergreen pilot clay coffee crawl pleasant strawberry closet careful tree past raised potato club picnic reaches under bush crown swept
Arts	drink murder sculpture dip poetry wall around crow machine key card dancing postman painting dress sill music bridge lip mail payment tired photography white

CONCEPT FORMATION ABILITY TEST ITEMS (continued)

<u>Concept</u>	<u>Stimulus Items</u>
Positions	seed bull paint down funny last dress eat up sill uncle want sentence rice in handle print mattress group first hayride out look groove
Things that Teach	repeat teacher soil hear lecture gay mark use cold dictionary curtain bird sing pattern break lesson shout purse newspaper fun book wonder stone some
Geography	ink mountain jar knife ocean build gun hollow worn continent youthful antelope rhyme stand country tank opera plant quick lake lemon mask city number
Social Ideals	horn leaf justice debt circle integrity paid scholar crowd sail deer righteousness uncle fried freedom pear line people equality sound liberty fame ought saucer
Expressions of Attitude	barrel criticize hurried noisy broken precious reward lead idle punish breaking bread blame borrow flower point brook leave claim praise believe cigar owe approve
Necessities of Life	rug board trip sleep timing glass food sky happy water hurt lift show air bank ring salt nail foot geese shelter girl ball pick

CONCEPT FORMATION ABILITY TEST ITEMS (continued)

<u>Concept</u>	<u>Stimulus Items</u>
Things that are White	fill hard vacation milk foam tobacco smile fast rest cap cotton bring cloud range pitch blow skin heel snow leather school tooth fish pig
Things made of Metal	desk scissors autumn ruby dandelion tear frying pan newspaper faucet fur apple aunt ice sailboat room wedding ring write team sad padlock sword friend box letter

APPENDIX B

PUPIL RESPONSES ON THE
CONCEPT FORMATION ABILITY TEST

TABLE XIX

SAMPLE RESPONSES ON THE TEST OF CLASSIFICATION ABILITY

Class Concept ¹	Exemplars of the Concept	Pupil Response and Scoring
Animal	tiger, monkey, zebra donkey, lion, giraffe	<u>Full credit</u> Animals....(gave all examples). They're all animals.
Flower	lily, aster, poppy, rose, pansy, sunflower	<u>Full credit</u> (Picked out all examples)... They're all plants... They're all flowers. They all have flower or flower names.
Color	pink, purple, green, blue, yellow, red	<u>Full credit</u> They're all colors... (picked out all examples).
Construction Worker	painter, mason, electrician, carpenter, bricklayer, plumber	<u>Full credit</u> They're all somebody that has a job... they're construction jobs. They're all workers... they all fix things... picked out all examples)... they're helping people... like they're fixing... they'd all work in a building.

¹These are the class concepts of the Concept Formation Ability Test

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Construction Worker (cont'd)	painter, mason, electrician, carpenter, bricklayer, plumber	They're people who help you make a house and paint it and everything like that ... (picked out all examples)... helpers (Picked out all examples)... They're all people who do handiwork. All have the name of some person's job... an occupation. (What kind of occupations?) Physical occupations... like the guys have to use their muscles to work. (Gave all examples)... They could all repair a house. <u>Half credit</u> (Gave all examples)... are work things. People who can make things with. <u>Full credit</u> (Gave all examples)... they're all instruments of an orchestra. Instruments on them... if you went to a concert you'd see some of them. <u>Full credit</u> They're all heights of things or how big they are... (Gave all examples)... Tell how large things are.
Musical Instruments	tuba, piccolo, piano, flute, drum, violin	
Sizes	small, big, little, large, enormous, tiny	

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Sizes (cont'd)	small, big, little, large, enormous, tiny	They mean small or big... (Gave all examples)... They're big or small. (Gave all examples)... They're words that mean something about you... if you're big or if you're small.
		<u>Half credit</u> Lengths... (gave all examples).
		<u>No credit</u> small, little... they're both tiny or small... (Can you give me an idea that tells about them?)... large, enormous, big... (What idea do you have now?) (No further response given) (Gave all examples)... they're all shapes.
Parts of the Body	brain, nose, finger, mouth, eye, ear	<u>Full credit</u> They're all parts of the face... (gave all examples)... they're all parts of the body. Features or different part of the body... (gave all examples).
		<u>No credit</u> (Gave all examples)... you need them... if you didn't have them, you couldn't live.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Parts of the Body (cont'd)	brain, nose, finger, mouth, eye, ear	They're something like on... (gave all ex- amples)... all on the face... it's something that's on you. It's a big thing... cannon, anchor, somebody, shower, armor, family.
Transportation	bicycle, boat, train, car, airplane, wagon	<u>Full credit</u> You can get on, in them and go somewhere... (gave all examples)... transportation. They're all things that move like... a plane flies. (Gave all examples)... They're things that help the human body to move. (Gave all examples)... all are machines and they're used for travelling. <u>Half credit</u> (Gave all examples)... they all move on wheels. Move on two wheels or four wheels... things what run... (gave all examples). Something that moves... (gave all examples). (Gave all examples)... they all travel

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Words of Action	cooking, skiing, running swinging, working, crying	<u>Full Credit</u> Different activities... such as cooking, skiing, running, swinging, working, crying. It's all kinda like kinds of movement... (gave all examples). They're all something to do... (gave all examples). They're actions. <u>Half credit</u> (Gave all examples)... sports. <u>No credit</u> They're all things that you do or need for camping or boating or something like that... cooking, lake, skiing, oar, swinging, wood. They're all outside... meadow, winter, lake, hail, wood, oar. Something that a person wears, has or does... eye, leg, frown, crew, crying, diamonds. (Gave all examples)... things that are done every day.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Words of Affection	honey, adorable, darling, sweetheart, dear, lover	<u>Full credit</u> (Gave all examples)... when somebody likes somebody, it's describing them. A person sort of liking another person... things they say about them... (gave examples). Names to call your husband maybe... (gave all examples). It has to do with something like love... (gave all examples). People's pronouncements about liking people... (gave all examples). They're all things that you call a girl maybe or describing a girl maybe... (gave all examples)... some girl that's in love... a man addressing his girl maybe. <u>Half credit</u> (Gave all examples)... something somebody likes. (Gave all examples)... emotions or loving. (Gave all examples)... you like girls.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Words of Affection (cont'd)	honey, adorable, darling, sweetheart, dear, lover	<u>No credit</u> Sort of like your girlfriend or something... (gave all examples)... your fiancée or something. (Gave all examples)... they're all means of expressing someone's looks... sorta if they're not pretty or they are. Something that's made sort of... talk, ocean, brook, bridge, table, house... making, sorta like, put together. House, table, bridge, brook, ocean, slip... like on a muddy, slippery hill and there's a river nearby... you might slip into the river. Something that you can eat... honey, oats, plum, sweetheart, deer, slip. All something that you use... table, house bridge, brook, ocean.
Plants	grass, evergreen, tree strawberry, potato, bush	<u>Full credit</u> They're all things that grow (gave all examples)... some are trees and some are foods... they're all plant-life.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Plants (cont'd)	grass, evergreen, tree, strawberry, potato, bush	(Gave all examples)... they are things that grow in a specific place... they're plants. (Gave all examples)... they're all kind of a plant or vegetation.
		<u>Half credit</u> (Gave all examples)... they got green leaves on them. (Gave all examples)... they are things to grow mostly in your own backyard. (Gave all examples)... they're things that grow to make the world better... they're living things. They're all something that grows... (gave all examples).
		<u>No credit</u> A tree... (gave all examples). Some are trees and some are vegetables... (gave all examples). (Gave all examples)... they all grow underground. Call, pilot, crawl, past, reaches, swept... they're all moving.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Arts	sculpture, poetry, dancing, painting, music, photography	<u>Full credit</u> They are all like a hobby... (gave all examples). They're all kinda like an art... (gave all examples). Cultural occupations... (gave all examples). (Gave all examples)... They're sort of like work ... it's sorta like fun. (Gave all examples)... entertainment or enjoyment. Different activities you do... sort of recreation ... (gave all examples). <u>Half credit</u> (Gave all examples)... they're all things people do. Sculpture, poetry, dancing, postman, music, photography... they're all things that we do to keep us busy. <u>No credit</u> They're pictures... (gave all examples)... they're pictures or shapes. (Gave all examples)... they're paintings.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Arts (cont'd)	sculpture, poetry, dancing, painting, music, photography	(Gave all examples)... they're communication. Making things... sculpture, wall, machine, painting, bridge, photography... they all have to do with making things. (Gave all examples)... they all are good at things... like a musician at music and a painter at painting. Someone that's famous doing it... (gave all examples). (Gave all examples)... people that work at different kinds of jobs. They're something to do with working... sculpture, poetry, machine, postman, mail, payment. Tired, music, dress, dancing, poetry... they're all things at a party... drink. Postman, mail, payment, card, murder, poetry... A postman delivers mail and a card, he gets his payment, he can murder someone, and he can say poetry. Things that are big... sculpture, poetry, machine, sill, bridge, photography.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Positions	down, last, up, in, first, out	<u>Full credit</u> Positions... (gave all examples). Up here (indicating the cards) it's a direction but here it's only first and last... (Gave all examples)... these are places, like. Something to do with where you are... (gave all examples)... in a way they tell you where you are. <u>Half credit</u> (Gave all examples)... names of things like... those words tell you like directions... they tell you where you go. <u>No credit</u> Something you do, like when you're down or up... (Gave all examples, adding <u>group</u>)... it's a group of people going in. (Gave all examples)... <u>down</u> goes with <u>up</u>, <u>last</u> goes with <u>first</u>, <u>in</u> goes with <u>out</u>. They're all things you can do like a plane can go up or down. Seed, eat, want, rice, group, hayride... sort of like farming.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Positions (cont'd)	down, last, up, in, first, out	Like when you look, you see on the paper the writing, ...paint, last, sill, sentence, print, look... sorta like paper. (Gave all examples)... they're pairs of opposites. They're saying something... down, honey, up, print, handle, look... they're something that happened. Actions... (gave all examples)... they're actions. Paint, funny, sill, sentence, print, groove... they're all things you do sometimes.
Things that Teach	teacher, lecture, lesson, dictionary, newspaper, book	<u>Full credit</u> (Gave all examples)... it's at school and you're learning... teaches you have to learn and listen and so on. Something that tell you something... (gave all examples)... things that you learn, sorta like. You learn from them... (gave all examples). (Gave all examples)... they help us to learn better... make like to know more.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Things that Teach (cont'd)	teacher, lecture, lesson, dictionary, newspaper, book	It's learning... (gave all examples)... they each have something to do with learning. (Gave all examples)... they're thinking, learning things. <u>Half credit</u> (Gave all examples)... it's sorta like a lesson in school. They have something to do with school... teacher, mark, dictionary, lesson, shout, wonder... things that teachers do. Repeat, lecture, dictionary, lesson, newspaper, book... things a teacher teaches. They're all something you could use in school... (gave all examples)... you could use it in a report. <u>No credit</u> Dictionary, newspaper, book, sing, lecture, repeat... all things with words on them. Hear, sing, lecture, shout... they have talking. Repeat, dictionary, use, lesson, newspaper, book, you're reading.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Things that Teach (cont'd)	teacher, lecture, lesson, dictionary, newspaper, book	Teacher, lecture, newspaper, pattern, dictionary, book... some sort of story or something. Teacher, lecture, dictionary, pattern, newspaper, book... there's a teacher and she teaches about arithmetic and it's in a book and they're all paper. Teacher can given a lesson and read a newspaper and mark a test and teacher can read a book and the teacher can give dictionary pages... the teacher can do them. Doing about school... book, have fun in school, you have a lesson, you use a dictionary, you have a lecture, and you have a teacher.
Geography	mountain, ocean, lake, continent, country, city	<u>Full credit</u> (Gave all examples)... are all some of the things you'd find on an atlas or map. (Gave all examples)... they're all part of the world. Features of the world... (gave all examples). They all tell about masses of land or water... (gave all examples).

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Geography (cont'd)	mountain, ocean, lake, continent, country, city	They all have things on land... like mountains in a certain place... like the Rocky Mountains or Calgary is a city... (gave all examples)... they're on land, I guess... they are on the earth. <u>Half credit</u> Different things... like they are places... (gave all examples)... they're places. (Gave all examples)... things you see outside like when you go travelling. (Gave all examples)... the land form... the formation of the land. <u>No credit</u> Lake, country, continent, ocean, mountain... things on a mountain. Things outside... (gave all examples). Mountain, build, continent, country, plant, city,... they're all solid. Knife, gun, worn, tank, quick, mask... things used by criminals. You can use them to kill... knife, gun, tank.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Geography (cont'd)	mountain, ocean, lake, continent, country, city	Knife, gun, antelope, country, lake, city... all things you can use for hunting.
Social Ideals	justice, integrity, freedom, righteousness, equality, fame	<u>Full credit</u> When people are treated fairly and are depended on... (gave all examples). Rights of the people... (gave all examples)... in democracy. The rights... the well-being... the right to speak out... overall freedom and the right to speak out. A country that has a democratic... a democracy. It describes a government or ideals of the government... (gave all examples). (Gave all examples)... they are things that are done to make peace and to do things right... and not to do things wrong and bad. Like in a court... things you'd hear about in a court... (gave all examples)... things that have to do with you and your country when you're trying to do right things in your country. <u>Half credit</u> (Gave all examples)... how people live... that they're free and things like that... they got a free life.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Social Ideals (cont'd)	justice, integrity, freedom, righteousness, equality, fame	They're all sorta a concern of the law and freedom... (gave all examples). (Gave all examples)... you're free to live in the world. (Gave all examples)... the idea gives me the feeling that everybody has his own rights and we don't have to be ruled by anyone... nobody's the king. They all have to do with a country that has freedom, justice, liberty (also gave the other examples)... when people came over to North America that's what they thought they'd get. <u>No credit</u> Like freedom and things like that... (gave all examples)... things that you see and hear in the paper. Would it have to do with a court case of something... (gave all examples)... questioning the suspect in a court case. (Gave all examples)... they have something to do with people. (Gave all examples)... they're things that you get... like when you get out of school, you can do what you want.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Social Ideals (cont'd)	justice, integrity, freedom, righteousness, equality, fame	(Gave all examples)... our city.
Expressions of Attitude	criticize, reward, punish, blame, praise, approve	<u>Full credit</u> (Gave all examples)... all things that one person can think about another person or say to him. Something you think of people... (gave all examples). Like to criticize somebody... like what you think of somebody... (gave all examples). Something what you are... (gave all examples)... tell what you think or what you are. Different feelings of a people... You'd criticize a person for doing something wrong and you'd reward a person for doing something right... (gave all examples)... they all tell you about a person's behavior. <u>Half credit</u> (Gave all examples)... some people do something... some other people can criticize, punish or blame them. Things that you may do to other people or things ... criticize, lead, punish, blame, claim, believe.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Expressions of Attitude (cont'd)	criticize, reward, punish, blame, praise, approve	(Gave all examples)... It's all something you could do to a person... like you could criticize them. <u>No credit</u> (Gave all examples)... they're something to do with ownership... if you steal or take it. Doing something... hurried, precious, idle, point, praise, oats... like somebody stole some- thing... like somebody found a thief and some- body's praising him. Something that you owe sort of like... owe, believe, borrow, punish, reward, hurried, some- thing that you owe. Approve, praise, blame, idle, precious, critic- ize,... they're all telling about a thing... about anything. Criticize, blame, broken, punish, claim, owe... Say your neighbor borrowed something and he broke it, you'd criticize him for it. Things that we use... barrel, lead, bread, point, brook, cigar.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Necessities of Life	sleep, food, water, air, salt, shelter	<u>Full credit</u> They're all things that you need... (gave all examples)... you need them, otherwise you wouldn't live. Things that we need to keep us in health... (gave all examples). <u>Half credit</u> (Gave all examples)... things that you eat... and about how you live. <u>No credit</u> Parts of the house... (gave all examples)... things that are found in the house. Trip, sky, water, air, geese... you're going on a trip some place... these all can fly. Sky, air, water, salt... has to do with the ocean. Shelter... they're all used when you go on a trip. Sleep, food, water, ring, foot, girl... they're in our life. Rug, glass, water, rain, nail, ball... they're things that you could use.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Necessities of Life (cont'd)	sleep, food, water, air, salt, shelter	Something you might do on a trip... or something you might use on a trip or ways you might go on a trip... trip, sky, water, air, foot, shelter
Things that are White	milk, foam, cotton, cloud, snow, tooth	<u>Full credit</u> They're all things that are white... (gave all examples). <u>No credit</u> Milk, tobacco, cotton, low, snow, school... well, they're in our life. Milk, tobacco, cotton, cloud, leather, tooth... they're things that we use, wear and eat. Milk, cotton, cloud, leather, tooth, tobacco... they're not living... some you get from plants and animals. Milk, foam, cotton, cloud, leather, fish... they're all soft. Hard, fast, cap, leather, blow, tooth... When you're going fast... they're hard things.

TABLE XIX (Continued)

Class Concept	Exemplars of the Concept	Pupil Response and Scoring
Things made of Metal	scissors, frying pan, faucet wedding ring, padlock, sword	<u>No credit</u> Scissors, frying pan, faucet, ice, padlock, letter... they're names of things we use to make things with. Desk, frying pan, faucet, broom, padlock, box... things you might find in your room. Things you might have in a house or home... desk, scissors, frying pan, newspaper, faucet, apple, room, padlock, letter. Something to do with school... desk, tear, apple, room, write, box. Newspaper, apple, wedding ring, padlock, letter ... you might find on a desk. Most of them come from, sort of, water... faucet, ice, team... you could have sort of a swimming team... sword -- swordfish, dandelions... they need water to grow. Sailboat, team friend, autumn... has to do with racing.

APPENDIX C

STANDARDIZED SURVEY TESTS



The Lorge-Thorndike Intelligence Tests

CANADIAN MULTI-LEVEL EDITION
VERBAL AND NONVERBAL BATTERIES

FORM 1
LEVELS A-F

Irving Lorge • Robert L. Thorndike • Elizabeth Hagen

Teachers College, Columbia University

Edgar N. Wright, Canadian Editor

Toronto Board of Education

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DIRECTIONS TO THE PUPIL

Marking Your Name and Date of Birth

You will mark your answers to the test exercises on the answer sheet you have before you. The answer sheet will be scored by a machine. This machine will also “read” and copy your name and date of birth from the answer sheet. To make this possible, you must mark your name in a special way on the “Name Block” on the answer sheet and you must also mark your date of birth in a special way just to the right of the Name Block.

Look at the sample Name Block below. This block has been marked for ARTHUR L. SWANSON. The name has been printed in a row of boxes across the bottom of the block. Notice that the last name is printed first, then the first name, then the middle initial. Notice, too, that a box has been left blank after SWANSON, and one after ARTHUR, to separate the parts of his name.

Now, notice that in the alphabet column above each letter the same letter in the column has been covered with a heavy black mark. The S has been blackened above the S in SWANSON, the W above the W, and so on. For the blank box after SWANSON, the empty oval at the top of the alphabet column has been blackened. The empty oval also has been blackened for the blank box following the first name, ARTHUR, for the blank box following the initial, L, and for all other unused boxes.

Study this sample name carefully for a moment to be sure you understand how it is marked.

Now look to the right of the sample Name Block. You will see two columns of ovals where Arthur Swanson's date of birth has been marked. The first column of ovals has the name of a month, or an abbreviation for the name of a month, beside each oval. The second column of ovals has a number before each oval indicating a particular year. Arthur Swanson was born in August, 1951. The oval next to the abbreviation AUG (for August) has been blackened to show that he was born in that month. The oval next to '51 has been blackened to show that he was born in the year 1951.

Study the marking of the sample date of birth carefully. Do not mark your own name or date of birth on your answer sheet until you are told to do so.

SAMPLE NAME BLOCK

[illegible]

THE LORGE-THORNDIKE INTELLIGENCE TESTS

DIRECTIONS: This booklet contains five tests which will give you a chance to show what you know and how well you think. You will be given directions to answer a certain number of exercises on each test; you will not be asked to try all the exercises on any one test. Before you begin each test, you will be told where to start and where to stop.

You will mark all your answers on your separate answer sheet. The answer sheet will also help you to keep the right place in each test. It has answer spaces for marking only those exercises that you are supposed to try. Do not write in this booklet.

Look at the first sample exercise below. It is correctly marked on the answer sheet. Study it carefully to see for yourself just how you are to mark your answers.

1. Choose the word which has the same meaning, or most nearly the same meaning, as the word in dark type at the beginning of the line.

dog A afraid B song C animal D large E fly

Now look at the next two samples. Choose the right answer and then, on the answer sheet, make a heavy black pencil mark in the answer space that has the same letter as the answer you picked.

2. In the group of choices lettered **F** to **K**, find the word that will make the best, the truest, and the most sensible complete sentence.

The sun always rises in the —————

F east **G** wind **H** night **J** rain **K** water

3. Choose the right answer to this problem and mark the answer space.

A boy bought a pencil for 10 cents and some paper for 10 cents. How much did he spend?

L 5 cents **M** 10 cents **N** 15 cents **P** 20 cents **Q** none of these

If you wish to change an answer, erase your mark completely, and then make another mark in the right answer space.

You may find some of the exercises very easy and some of them rather hard. Try to answer every exercise in the part of the test that you are supposed to do, but do not spend too much time on those that you find very hard. Do those that you can, and then, if you still have time left, go back and do those that you skipped. You are not expected to be able to answer all the exercises correctly. Always do your very best.

At the beginning of each test there are directions that tell you what to do, and you will be told where you are to start and where you are to stop on that test. Wait until you are told to begin before turning the page.



IV A-F

For each exercise in this test you are to read the word in dark type at the beginning of that exercise. Then, from the five words that follow you are to choose the word that has the same meaning or most nearly the same meaning as the word in dark type. Look at sample exercise 0.

0. loud A quick B noisy C hard D heavy E weak

The word which has most nearly the same meaning as **loud** is **noisy**. The letter in front of **noisy** is **B**, so on your answer sheet make a heavy black pencil mark in the **B** answer space for exercise 0.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 4, exercise 1	→	Exercise 25 on page 5
LEVEL B	→	Page 4, exercise 6	→	Exercise 30 on page 6
LEVEL C	→	Page 5, exercise 11	→	Exercise 35 on page 6
LEVEL D	→	Page 5, exercise 16	→	Exercise 40 on page 6
LEVEL E	→	Page 5, exercise 21	→	Exercise 45 on page 6
LEVEL F	→	Page 5, exercise 26	→	Exercise 50 on page 7

LEVEL A
BEGIN HERE



- | | | | | | |
|-----------|-------------|----------|----------|------------|---------|
| 1. land | A ground | B town | C roof | D river | E grass |
| 2. rose | F music | G flower | H food | J view | K lasso |
| 3. toss | L drink | M add | N sum up | P lower | Q throw |
| 4. last | R hope | S shoe | T back | U end | V king |
| 5. beside | A lay siege | B over | C how | D close to | E few |

LEVEL B
BEGIN HERE



- | | | | | | |
|-------------|---------|--------|-----------|----------|----------|
| 6. move | F sleep | G live | H laugh | J drink | K shove |
| 7. elephant | L bird | M zoo | N snake | P animal | Q fish |
| 8. enter | R place | S play | T try out | U leave | V go in |
| 9. easy | A hard | B full | C heavy | D simple | E hungry |
| 10. single | F one | G many | H some | J all | K few |

Go right on to the next page.

LEVEL C
BEGIN HERE

11. unsuccessful L awkward M stupid N failure P slow Q dirty
12. must R can S may T learn U mind V should
13. carpenter A ruin B red carpet C building D clam E workman
14. mix F combine G skip H reach J colour K lose
15. adjust L parole M account N disturb P regulate Q render

LEVEL D
BEGIN HERE

16. triangular R geodetic S surveying T surveyed U three-sided V equilateral
17. torture A toper B total C law D labyrinth E torment
18. dew F storm G moisture H drop J honey K fog
19. grip L grate M grow N gyrate P grasp Q grin
20. detail R sale S insurance T item U bookkeeper V poison

LEVEL E
BEGIN HERE

21. fasten A fix B divide C feed D loosen E grease
22. heavily F lightly G solidly H feverish J goodly K weakly
23. conqueror L inspector M victor N rancher P dealer Q horse
24. hairy R light S beguiled T divested U shaggy V unique
25. hunger A food B famine C frustration D fake E force

LEVEL A STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

LEVEL F
BEGIN HERE

26. sob F prejudice G solemn H sigh J joy K kind
27. recipe L catch M share N formula P narrative Q payment
28. charitable R relentless S evil T sympathetic U poetic V keen
29. seal A armour B realm C post D vision E signet

Levels B–F go right on to the next page.

30. bandit F rat G lute H ammunition J brigand K abuse

LEVEL B STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

31. exclamation L supplication M outcry N uplift P calamity Q persecution

32. emigrant R encouragement S distinction T dolt U ignorance V colonist

33. sergeant A physician B specialist C recruit D minor officer E civilian

34. agile F nervous G antiseptic H nimble J pugnacious K terrified

35. conviction L surmise M release N hope P trial Q firm belief

LEVEL C STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

36. countless R few S innumerable T crazy U royalty V foreign

37. artfully A disgracefully B falsely C cunningly D frankly E assuredly

38. contemptible F simultaneous G vile H cooperative J deferential K thoughtful

39. advent L arrival M pocket N sweet P lance Q departure

40. exasperate R scoop S irritate T speak U sicken V elevate

LEVEL D STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

41. cannibal A kind B murderous C dumb D attacking E Biblical

42. spigot F alcohol G faucet H slang J shade K expectoration

43. affliction L coincidence M agitator N calamity P supplement Q wealth

44. poultice R fowl S wet dressing T dandruff U coinage V pulp

45. reck A heed B dare C subtract D sail E despise

LEVEL E STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

Level F go right on to the next page.

46. patent F officer G client H license J head K sheen
47. configuration L small girl M form N abacus P establishment Q corporation
48. tangible R ghostly S substantial T pungent U obstructive V twisting
49. cite A find B guess C refuse D quote E pass a law
50. compeer F enemy G angle H native J curve K equal

LEVEL **F** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

DO NOT WRITE IN THIS BOOKLET.



IV A-F

In each exercise in this test, a word has been left out of a sentence. Read the sentence carefully; then, from the five words that follow, choose the one word that will make the best, the truest, and the most sensible complete sentence. Look at sample exercise 0.

0. Hot weather comes in the _____.

A fall

B night

C summer

D winter

E snow

The best answer is **summer**. The word **summer** makes the best, truest, and most sensible complete sentence. The letter in front of summer is **C**, so on your answer sheet make a heavy black pencil mark in the **C** answer space for exercise 0.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 8, exercise 1	→	Exercise 20 on page 9
LEVEL B	→	Page 8, exercise 5	→	Exercise 24 on page 10
LEVEL C	→	Page 9, exercise 9	→	Exercise 28 on page 10
LEVEL D	→	Page 9, exercise 13	→	Exercise 32 on page 10
LEVEL E	→	Page 9, exercise 17	→	Exercise 36 on page 11
LEVEL F	→	Page 10, exercise 21	→	Exercise 40 on page 11

LEVEL A
BEGIN HERE



1. Boys will become _____.

A infants

B little

C intelligent

D stupid

E men

2. Boats sail in the _____.

F water

G sky

H land

J oars

K tree

3. We see _____ only at night.

L children

M plants

N stars

P houses

Q trees

4. Coal is _____; snow is white.

R blue

S white

T red

U green

V black

LEVEL B
BEGIN HERE



5. All people see with their _____.

A ears

B noses

C eyes

D throats

E mouths

6. Fred was six years old. There were six _____ on his birthday cake.

F candles

G boys

H girls

J parties

K children

Go right on to the next page.

7. In the spring the buds form on the branches of the _____.
 L trees M rivers N bugs P leaves Q animals

8. The ragged _____ may prove a good horse.
 R puppy S child T calf U lamb V colt

LEVEL C
 BEGIN HERE

9. Not every cloud gives _____.
 A weather B shade C sky D climate E rain

10. The _____ must bend when the wind blows upon it.
 F ground G house H path J grass K sky

11. Caterpillars spin _____ for themselves in the fall.
 L webs M around N moths P cocoons Q butterflies

12. Good company on a journey makes the _____ seem shorter.
 R feast S way T joy U work V care

LEVEL D
 BEGIN HERE

13. Nothing out of its place is good and nothing in its place is _____.
 A there B bad C right D shelved E simple

14. I know of no way of judging the _____ but by the past.
 F former G future H priority J morn K decline

15. How the _____ roses flush up in the cheeks!
 L white M pretty N small P yellow Q red

16. Coal is a portable climate. It carries the _____ of the tropics to Labrador and the polar circle.
 R fuel S heat T energy U humidity V vegetation

LEVEL E
 BEGIN HERE

17. How far the little _____ throws its beams!
 A candle B cake C sky D puppy E night

18. The person who _____ another must make good the damages.
 F reforms G improves H instructs J injures K delights

19. False facts are highly _____ to the progress of science.
 L injurious M necessary N devoted P useful Q instrumental

20. Let your accusations be few in number, even if they be _____.
 R unfair S criminal T just U many V critical

LEVEL A STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

Levels B-F go right on to the next page.

LEVEL F
BEGIN HERE



21. The important thing is not so much that every child should be taught, as that every child should be given the wish to ————
A learn B play C hope D reject E teach
22. It must be ————: I've done it from my youth.
F right G wrong H factual J rude K kind
23. The only stable state is the one in which all men are ———— before the law.
L just M right N equal P guiltless Q natural
24. The world is a comedy to those who think; a ———— to those who feel.
R circus S drama T farce U satire V tragedy

LEVEL B STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

25. No garden is without its ————
A sun B rain C weeds D work E tools
26. ———— is a department of lying.
F Delusion G Exactness H Exaggeration J Care K Example
27. The coward threatens only when he is ————
L afraid M surrounded N safe P conquered Q happy
28. ———— vigilance is the price of freedom.
R Careful S Desperate T Eternal U Equal V Infernal

LEVEL C STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

29. Cause and effect, means and ends, seed and ———— cannot be severed.
A caution B thought C fruit D science E philosophy
30. The vanquished never yet spoke ———— of the conqueror.
F ill G well H little J nastily K often
31. ———— are the rightful and peaceful successors of bullets.
L Briberies M Revolutions N Weapons P Ballots Q Autocrats
32. The foundation of all science is ————
R observation S invention T knowledge U theory V art

LEVEL D STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

Levels E-F go right on to the next page.

33. It is ————— to be generous with other people's property.
 A desirable B necessary C good D important E easy
34. Infantry is the ————— of an army.
 F battle G weakness H handicap J nerve K luxury
35. It is much easier to be critical than to be —————.
 L false M spurious N free P correct Q disparaging
36. A good newspaper deals ————— with controversial subjects and treats disputed issues with impartiality.
 R conservatively S dispassionately T gingerly U relentlessly V sparingly

LEVEL E STOP HERE · WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

37. When we are —————, it is proof that we speak well; and all your learned gabble is mere nonsense.
 A ambiguous B ridiculous C vague D perplexing E understood
38. Think long when you may ————— only once.
 F abstain G live H die J decide K eat
39. It is better that ten guilty persons —————, than that one innocent suffer.
 L suffer M escape N capture P starve Q repent
40. It is sometimes difficult to distinguish between the open mind and the ————— one.
 R closed S fickle T empty U busy V thoughtful

LEVEL F STOP HERE · WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

DO NOT WRITE IN THIS BOOKLET.



1V A-F

In this test you are to work some arithmetic problems. After each problem are four possible answers and a fifth choice, "none of these," meaning that the correct answer is not given.

Work each problem and compare your answer with the four possible answers. If the correct answer is given, fill in the space on the answer sheet that has the same letter as the right answer. If the correct answer is not given, fill in the space on the answer sheet that has the same letter as "none of these." Look at sample exercise 0.

0. If candy costs a cent a piece, how much will nine pieces cost?

A 1¢ B 7¢ C 8¢ D 9¢ E none of these

The correct answer is 9¢. The letter in front of 9¢ is **D** so on your answer sheet make a heavy black pencil mark in the **D** answer space for exercise 0.

Now look at sample exercise 00.

00. Mrs. Jones bought a pound of potatoes for 10¢ and a pound of spinach for 15¢. How much did she spend?

F 5¢ G 10¢ H 15¢ J 20¢ K none of these

The correct answer is 25¢. The answers at **F**, **G**, **H**, and **J** are wrong, so you would choose "none of these" as your correct answer. The letter in front of "none of these" is **K** so on your answer sheet make a heavy black pencil mark in the **K** answer space for exercise 00.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 12, exercise 1	→	Exercise 15 on page 13
LEVEL B	→	Page 13, exercise 4	→	Exercise 18 on page 14
LEVEL C	→	Page 13, exercise 7	→	Exercise 21 on page 14
LEVEL D	→	Page 13, exercise 10	→	Exercise 24 on page 14
LEVEL E	→	Page 13, exercise 13	→	Exercise 27 on page 15
LEVEL F	→	Page 14, exercise 16	→	Exercise 30 on page 15

LEVEL A
BEGIN HERE



1. Jim bought a candy bar for 5 cents and a piece of gum for 2 cents. How much did he pay for both?

A 3¢ B 7¢ C 10¢ D 52¢ E none of these

2. Ben is just 13 years old. How old will he be when he goes to college, if he will go there in just five years?

F 8 G 17 H 18 J 19 K none of these

3. Helen bought a pad for 5 cents, some candy for 12 cents, and a pen for 6 cents. How much did she spend altogether?

L 21¢ M 22¢ N 23¢ P 33¢ Q none of these

Go right on to the next page.

LEVEL B
BEGIN HERE



4. A pad costs 5 cents. How much will 4 pads cost?
R 9¢ S 16¢ T 18¢ U 25¢ V none of these
5. John bought some peanuts for 10 cents. He gave the man 25 cents. How much change should he get back?
A 35¢ B 25¢ C 20¢ D 15¢ E none of these
6. Jane had 36 cookies. She gave away 21 of them. How many did she have left?
F 14 G 15 H 17 J 57 K none of these

LEVEL C
BEGIN HERE



7. Dick wants to buy some 5¢ pencils. How many can he buy for 25 cents?
L 5 M 20 N 25 P 30 Q none of these
8. A classroom has 5 rows of seats with 7 seats in each row. How many children can be seated in the room?
R 2 S 12 T 35 U 57 V none of these
9. A ball team played 37 games and won or tied 24 of them. How many did it lose?
A 3 B 12 C 13 D 61 E none of these

LEVEL D
BEGIN HERE



10. There are 20 children in a class. Each gives the teacher 10 cents for milk. How much does the teacher get in all?
F 10¢ G 30¢ H \$1.00 J \$2.00 K none of these
11. Every time Mr. Dwyer draws a cheque, his bank charges him 5¢. How much does the bank charge him during one month for 23 cheques?
L \$.25 M \$.28 N \$1.05 P \$1.15 Q none of these
12. A quart of ice cream will fill 10 cones. If the pupils plan to sell 200 cones at the school carnival, how many quarts of ice cream should they order?
R 10 S 20 T 190 U 210 V none of these

LEVEL E
BEGIN HERE



13. How much will a half-pound of hamburger cost Mrs. Jones if it sells for 80¢ a pound?
A \$.20 B \$.50 C \$.80 D \$1.60 E none of these
14. The cost of a round trip ticket between cities A and B is \$5.45. A one-way ticket costs \$2.90. How much money would a family save by buying three round trip tickets instead of six one-way tickets?
F \$1.15 G \$1.95 H \$3.10 J \$.29 K none of these
15. Mr. Ronald told Peggy that he would give her \$1200 to pay for her first year at college. If he gave her \$480 to start with and the rest in eight monthly payments, how much was she to receive each month?
L \$80 M \$90 N \$133 $\frac{1}{3}$ P \$720 Q none of these

LEVEL A STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 4

Levels B-F go right on to the next page.

LEVEL F
BEGIN HERE



16. How much did Bob pay for a half-pound of candy that sells for 60 cents a pound?
R \$.15 S \$.50 T \$.60 U \$1.20 V none of these
17. Alice bought 5 pounds of gumdrops at 40¢ a pound. She put equal amounts of the gumdrops in bags and sold the 60 bags at 5¢ each. How much profit did she make?
A \$1.00 B \$2.60 C \$.95 D \$5.00 E none of these
18. If $3\frac{1}{2}$ tons of scrap iron are sold for \$140, what is the selling price per ton?
F \$49 G \$35 H \$14 J \$46.67 K none of these

LEVEL B STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 4

19. Mrs. Sterne bought a $5\frac{3}{4}$ lb. chicken at 52¢ a pound. How much did the chicken cost her?
L \$263.75 M \$27.68 N \$2.99 P \$.57 $\frac{3}{4}$ Q none of these
20. Mary's history book has 425 pages and 25 chapters. The average length of a chapter is how many pages?
R 15 S 42 T $17\frac{2}{5}$ U 17 V none of these
21. By how much must you multiply 24 to make the product equal the sum of 36 and 72?
A $4\frac{1}{2}$ B $1\frac{1}{2}$ C 3 D $\frac{2}{9}$ E none of these

LEVEL C STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 4

22. Dan is making a scale drawing of a house on which $\frac{1}{8}$ inch represents 1 foot. How long a line should he use for a room that is 20 feet long?
F $\frac{5}{3}$ in. G $2\frac{1}{2}$ in. H $2\frac{1}{4}$ in. J 160 in. K none of these
23. A worker has to make 500 cake decorations in one day in order to get a bonus. By 3 o'clock, Minnie had made 360. How many must she make every 30 minutes in order to finish the 500 by 5 o'clock?
L 40 M 60 N 35 P 70 Q none of these
24. Mr. Norton bought a desk for \$36. He wants to sell it so that his profit will be 50% of what the desk cost him. For what price should he sell it?
R \$18 S \$45 T \$54 U \$72 V none of these

LEVEL D STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 4

25. Peter buys magazines for 7¢ each and sells them for 10¢ each. Last month he sold 100 magazines. How many more magazines must he sell this month than last month in order to make a profit of \$4.50?
A 150 B 145 C 15 D 100 E none of these

26. Mr. Barnes earns \$80 a week. He is offered a new job for which he would be paid a salary of \$40 a week plus a commission of 5% of the sales he makes each week. If he takes the new job, how much would his sales each week have to be for his total income to be \$100 a week?
- F \$300 G \$60 H \$12 J \$1200 K none of these

27. Mr. Stubbs has to travel from Winnipeg to Edmonton. He can take a train that leaves Winnipeg at 2 P.M. Central Standard Time and reaches Edmonton at 6 A.M. Mountain Standard Time the next morning. Or he can take a plane that leaves Winnipeg at 2 P.M. Central Standard Time and reaches Edmonton at 6 P.M. Mountain Standard Time the same day. How much time will he save if he goes by plane?
- L 10 hr. M 4 hr. N 13 hr. P 12 hr. Q none of these

LEVEL E STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 4

28. Sam gets 20% of the price for each magazine subscription that he sells. He wants to earn \$50 during the summer. What is the value of the subscriptions he will have to sell?
- R \$10 S \$40 T \$50 U \$200 V none of these
29. What is the cost of 900 articles at 11 cents a hundred?
- A \$.99 B \$99.00 C $\$.81\frac{9}{11}$ D \$10.11 E none of these
30. A table model radio set is made to sell for \$29.75. The dealer's cost is 60% of the established selling price. What is the dealer's gross profit per set?
- F \$17.85 G \$49.58 H \$11.90 J \$41.65 K none of these

LEVEL F STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 4

DO NOT WRITE IN THIS BOOKLET.



1V A-F

For each exercise in this test, a series of words is given in dark type. You are to figure out how the words in dark type are alike, then you are to choose the one word among the five on the line below that belongs with the words in dark type. Look at sample exercise 0.

0. rose daisy violet

A red

B garden

C sweet

D grow

E lily

All the words in dark type are the names of flowers. Of the five words on the line below, only **lily** is the name of a flower. The letter in front of **lily** is **E**, so on your answer sheet make a heavy black pencil mark in the **E** answer space for exercise 0.

Now look at exercise 00. Think in what way the words in dark type go together. Then find the word on the line below that belongs with them.

00. go run walk move

F think

G dream

H march

J sing

K seem

The right answer is **march**. The letter in front of **march** is **H** so on your answer sheet make a heavy black pencil mark in the **H** answer space for exercise 00.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 16, exercise 1	→	Exercise 20 on page 18
LEVEL B	→	Page 16, exercise 5	→	Exercise 24 on page 18
LEVEL C	→	Page 17, exercise 9	→	Exercise 28 on page 18
LEVEL D	→	Page 17, exercise 13	→	Exercise 32 on page 19
LEVEL E	→	Page 17, exercise 17	→	Exercise 36 on page 19
LEVEL F	→	Page 18, exercise 21	→	Exercise 40 on page 19

LEVEL A
BEGIN HERE



1. cake bread crackers

A flour

B cereal

C wheat

D cookies

E corn

2. dish cup glass

F fork

G food

H plate

J drink

K meal

3. Sarah Clara Joan

L Ben

M Freddy

N Louise

P Sam

Q Ronald

4. pencil chalk crayon

R paper

S letter

T easel

U pen

V paint

LEVEL B
BEGIN HERE



5. Ed Dick Pete

A Benjamin

B Ted

C Harold

D Melvin

E Arthur

Go right on to the next page.

6. potato beet pea
 F nut G banana H vegetable J dinner K carrot

7. hand chin eye toe
 L glove M shoe N hair P touch Q forehead

8. bird kite airplane butterfly
 R insect S bat T animal U ship V train

LEVEL C
 BEGIN HERE



9. violet rose poppy
 A cherry B apple C garden D tulip E hemlock

10. pot kettle broiler skillet
 F sink G stove H tumbler J tray K pan

11. iron brass steel copper
 L glass M tin N leather P asbestos Q wood

12. walnut almond filbert
 R lime S broccoli T bean U pea V pecan

LEVEL D
 BEGIN HERE



13. corn rye wheat barley
 A rice B carrots C cucumber D bean E tomato

14. book magazine letter
 F newspaper G movie H radio J lecture K read

15. pumps sneakers Oxfords sandals
 L skis M hose N gloves P moccasins Q skates

16. gift bequest legacy donation
 R subscription S just claim T lease U contribution V collection

LEVEL E
 BEGIN HERE



17. star moon planet
 A sky B solar C planetarium D telescope E sun

18. trousers breeches knickers pants
 F shorts G skirts H kilts J coats K mackinaws

19. moral virtuous upright
 L cultured M industrious N ethical P legal Q learned

Go right on to the next page.

20. car cab wagon cart
 R train S carriage T vehicle U motor V tandem

LEVEL A STOP HERE · WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 5

LEVEL F
 BEGIN HERE



21. volunteer neophyte inexperienced beginner
 A contract B amateur C unimportant D common E profession

22. pepper clove cinnamon nutmeg
 F onion G salt H beet J relish K soup

23. honesty loyalty sincerity faithfulness
 L passivity M servility N devotion P obsequiousness Q compliance

24. latitude longitude parallel circle
 R map S hemisphere T continent U zone V meridian

LEVEL B STOP HERE · WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 5

25. ignition motor generator clutch
 A gasoline B sedan C garage D chauffeur E brake

26. crest insignia escutcheon shield
 F favour G genealogy H uniform J steed K coat of arms

27. pound inch degree minute
 L gauge M rate N value P quart Q standard

28. captain general major lieutenant
 R ensign S admiral T colonel U sergeant V corporal

LEVEL C STOP HERE · WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 5

29. sheep pig cow horse
 A dog B rabbit C deer D wolf E beaver

30. lawyer nurse engineer accountant
 F merchant G butcher H carpenter J teacher K clerk

31. caricature parody burlesque satire
 L reflect M echo N parrot P simulate Q mimic

Levels D-F go right on to the next page.

32. town city capital metropolis
 R province S county T suburb U esplanade V country

LEVEL **D** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 5

33. amble saunter stroll
 A dash B hike C lumber D scamper E stagger

34. house skyscraper hospital museum
 F library G store H railroad J office K fort

35. Koran Veda Edda
 L Beowulf M Buddha N Allah P Cassandra Q Bible

36. shutter lens film filter
 R diaphragm S camera T negative U print V exposure

LEVEL **E** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 5

37. cloak mantle greatcoat ulster
 A jersey B dress C shawl D overcoat E gabardine

38. peninsula delta island isthmus
 F bay G continent H cape J terra firma K oasis

39. vessel utensil vase jar
 L bassinet M cradle N vat P cistern Q canister

40. baroque ornate grotesque bizarre
 R rococo S unique T grandiose U lurid V profound

LEVEL **F** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 5

DO NOT WRITE IN THIS BOOKLET.



1V A-F

For each exercise in this test, a pair of words is given that are related to each other in some way. Look at the first two words and figure out how they are related to each other. Then, from the five words on the line below, choose the word that is related to the third word in the same way. Look at sample exercise 0.

0. laugh → happy : cry →

A wonder

B sad

C hide

D lost

E rough

The right answer is **sad** because you **laugh** when you are **happy** and you **cry** when you are **sad**. The letter before **sad** is **B** so on your answer sheet make a heavy black pencil mark in the **B** answer space for exercise 0.

Now look at exercise 00.

00. chair → sit : bed →

F lie

G bedroom

H night

J crib

K tired

The right answer is **lie** because you **sit** in a **chair** and you **lie** in **bed**. The letter in front of **lie** is **F** so on your answer sheet make a heavy black pencil mark in the **F** answer space for exercise 00.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 20, exercise 1	→	Exercise 20 on page 22
LEVEL B	→	Page 21, exercise 5	→	Exercise 24 on page 22
LEVEL C	→	Page 21, exercise 9	→	Exercise 28 on page 22
LEVEL D	→	Page 21, exercise 13	→	Exercise 32 on page 23
LEVEL E	→	Page 21, exercise 17	→	Exercise 36 on page 23
LEVEL F	→	Page 22, exercise 21	→	Exercise 40 on page 23

LEVEL A
BEGIN HERE



1. bird → fly : snake →

A spring

B crawl

C ground

D bite

E cold

2. comb → hair : brush →

F teeth

G sweep

H clean

J mop

K crumb

3. cow → milk : hen →

L chick

M cluck

N house

P rooster

Q egg

4. red → green : danger →

R signal

S safety

T fire

U stop

V accident

Go right on to the next page.

LEVEL B
BEGIN HERE



5. cat → kitten : dog →

A puppy

B hound

C bark

D bite

E pet

6. rose → red : violet →

F sweet

G blue

H flower

J meadow

K spring

7. forest → tree : garden →

L rake

M gladiolus

N blossom

P flower

Q fruit

8. ruler → length : scale →

R drawing

S weight

T map

U pound

V numbers

LEVEL C
BEGIN HERE



9. ball → round : paper →

A white

B fold

C flat

D write

E pencil

10. boy → girl : brother →

F child

G son

H father

J sister

K daughter

11. for → against : friend →

L hate

M kind

N best

P enemy

Q pal

12. book → chapter : play →

R stage

S scenery

T cast

U act

V drama

LEVEL D
BEGIN HERE



13. father → uncle : mother →

A aunt

B sister

C grandmother

D girl

E woman

14. milk → butter : wheat →

F flour

G chaff

H cake

J food

K baking

15. five → basketball : nine →

L team

M game

N bat

P glove

Q baseball

16. drum → stick : violin →

R handle

S music

T stand

U strings

V bow

LEVEL E
BEGIN HERE



17. truck → sand : bus →

A school

B people

C car

D driver

E stop

18. handkerchief → linen : dress →

F dressmaker

G cotton

H style

J apparel

K print

Go right on to the next page.

19. outline → subtopic : plan →

L detail

M fence

N mansion

P architect

Q antenna

20. speaker → introduction : author →

R contents

S index

T digest

U title page

V preface

LEVEL A STOP HERE AND CLOSE YOUR TEST BOOKLETLEVEL F
BEGIN HERE

21. come → go : save →

A money

B bank

C keep

D spend

E dime

22. leg → walk : arm →

F sleeve

G hand

H glove

J throw

K army

23. human being → arm : tree →

L trunk

M twig

N limb

P foliage

Q growth

24. propose → bill : pass →

R law

S parliament

T majority

U veto

V vote

LEVEL B STOP HERE AND CLOSE YOUR TEST BOOKLET

25. scales → fish : shell →

A seashore

B ocean

C ornament

D oyster

E fruit

26. sell → storekeeper : buy →

F retail

G wholesaler

H consumer

J manufacturer

K goods

27. few → many : small →

L tiny

M much

N large

P short

Q one

28. jeopardy → security : hazard →

R quarantine

S safeguard

T custodian

U peril

V convoy

LEVEL C STOP HERE AND CLOSE YOUR TEST BOOKLET

29. automobile → manufacture : home →

A rent

B buy

C build

D mortgage

E own

Levels D-F go right on to the next page.

30. plaintiff → defendant : prosecution →
 F litigation G decision H defense J replication K appellant

31. obligation → duty : right →
 L ceremony M responsibility N privilege P law Q mores

32. play → authorship : machine →
 R production S manufacture T invention U publication V motor

LEVEL D STOP HERE AND CLOSE YOUR TEST BOOKLET

33. biology → microscope : astronomy →
 A telescope B binoculars C lens D stratosphere E heavens

34. king → abdicate : prime minister →
 F disdain G retract H coup d'état J veto K resign

35. fertility → fruition : sterility →
 L destruction M disruption N dissolution P extinction Q subversion

36. liveliness → abandon : languor →
 R procrastination S restraint T freedom U slumber V stupor

LEVEL E STOP HERE AND CLOSE YOUR TEST BOOKLET

37. break → fix : cut →
 A heal B knife C hurt D bleed E slice

38. secret → conceal : information →
 F invent G acknowledge H transpire J disclose K concede

39. botany → flora : zoology →
 L menagerie M cows N fauna P farm Q veterinary

40. agitation → energy : quiescence →
 R soporific S anaesthesia T tumescence U lethargy V sloth

LEVEL F STOP HERE AND CLOSE YOUR TEST BOOKLET

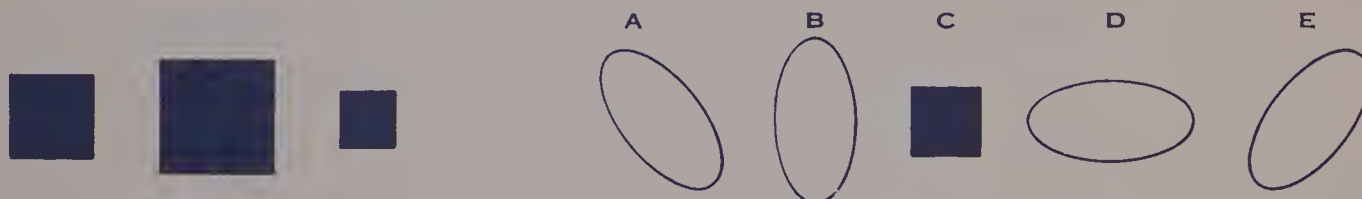
THE LORGE-THORNDIKE INTELLIGENCE TESTS

DIRECTIONS: This booklet contains three tests that will give you a chance to show what you know and how well you think. You will be asked to try some exercises in each of the three tests but never all the exercises in any one test. Before you begin each test you will be told where to start and where to stop.

You will mark all your answers on your separate answer sheet. The answer sheet will also help you to keep the right place in each test. It has answer spaces for marking only those exercises that you are supposed to try. Do not write in this booklet.

Look at the first sample exercise below. It is correctly marked on the answer sheet. Study it carefully to see for yourself just how you are to mark your answers.

1. The first three drawings in the row below are alike in a certain way. Find the drawing at the right that goes with the first three.



The **C** answer space has been marked because the only black square at the right is at **C**.

Now look at the next sample. Choose the right answer and then, on the answer sheet, make a heavy black pencil mark in the answer space that has the same letter as the answer you picked.

2. The first four numbers in the row below are in a certain order. In the group of choices lettered **F** to **K**, find the number that should come next.

1 2 3 4 → **F** 5 **G** 6 **H** 7 **J** 8 **K** 9

The number that should come next after 1 2 3 4 is 5. Make a heavy black pencil mark in the **F** answer space for sample exercise 2. You will be given more chances for practice before beginning each of the tests that follow.

If you wish to change an answer, erase your mark completely, and then make another mark in the right answer space.

You may find some of the exercises very easy and some of them rather hard. Try to answer each of the exercises in the part of the test that you are supposed to do, but do not spend too much time on those that you find very hard. Do those that you can, and then, if you still have time left, go back and do those that you have skipped. You are not expected to be able to answer all the exercises correctly. Always do your very best.

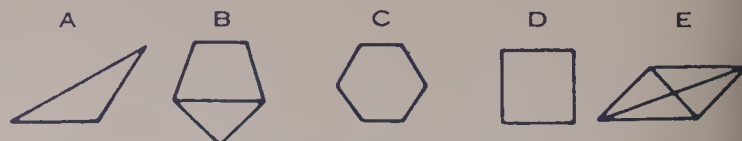
At the beginning of each test there are directions that tell you what to do, and you will be told where you are to start and where you are to stop on that test. Wait until you are told to begin before turning the page.



1NV-AF

For each exercise in this test, a series of drawings is given which are alike in a certain way. You are to figure out in what way the drawings are alike. Then you are to find the drawing at the right that goes with the first group. Look at sample exercise 0. The first three drawings in the row are alike in a certain way. Find the drawing at the right that goes with the first three.

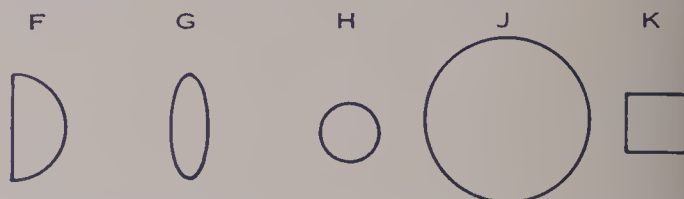
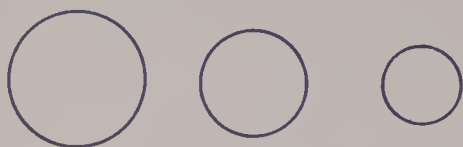
0.



The first three drawings are alike in that each has four sides and no lines inside it. The drawing at the right that goes with them is at **D**. It has four sides and no lines inside it. Make a heavy black pencil mark in the **D** answer space for exercise 0.

Now look at exercise 00. Find the drawing at the right that goes with the first three.

00.



The first three drawings are alike in that they are all circles and they are getting smaller. At the right the only one that is a circle and is still smaller is at **H**. Make a heavy black pencil mark in the **H** answer space for exercise 00.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

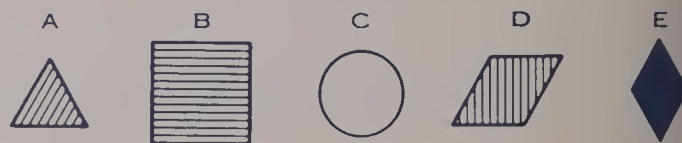
Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 26, exercise 1	→	Exercise 25 on page 29
LEVEL B	→	Page 27, exercise 6	→	Exercise 30 on page 30
LEVEL C	→	Page 27, exercise 11	→	Exercise 35 on page 30
LEVEL D	→	Page 28, exercise 16	→	Exercise 40 on page 31
LEVEL E	→	Page 28, exercise 21	→	Exercise 45 on page 31
LEVEL F	→	Page 29, exercise 26	→	Exercise 50 on page 32

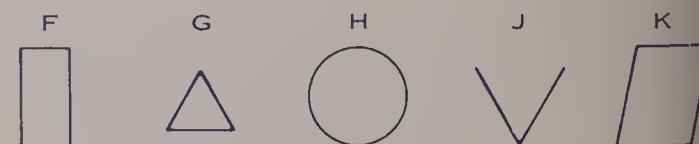
LEVEL A
BEGIN HERE



1.



2.

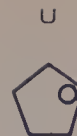


3.

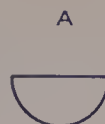


Go right on to the next page.

4.



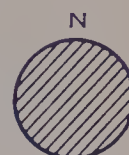
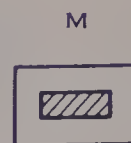
5.



6.



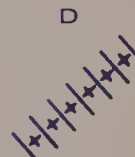
7.



8.



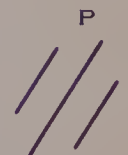
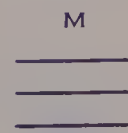
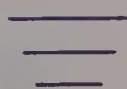
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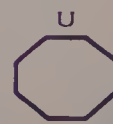
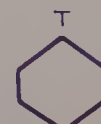
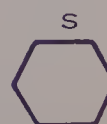
10.



11.



12.



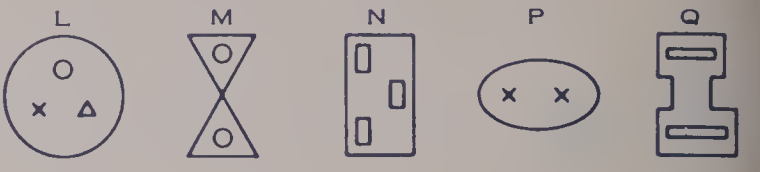
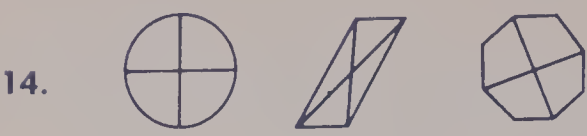
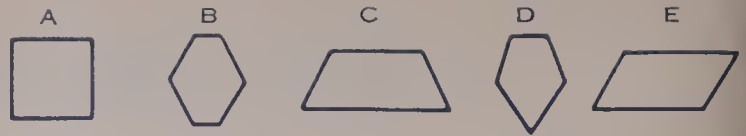
LEVEL B
BEGIN HERE



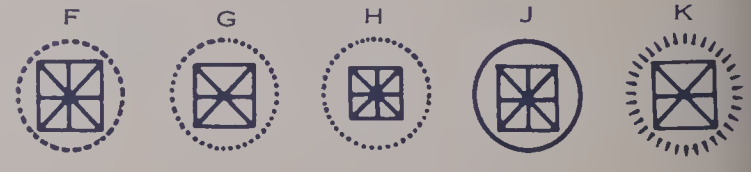
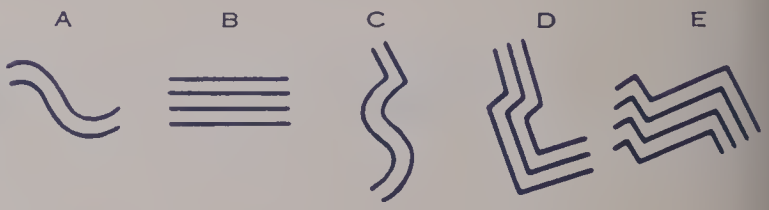
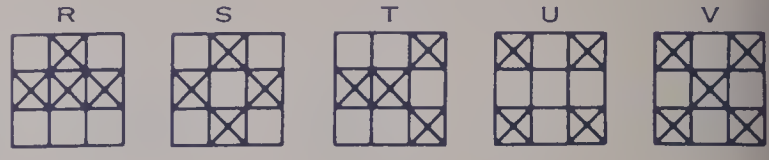
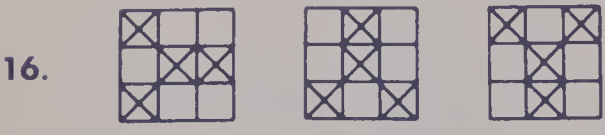
LEVEL C
BEGIN HERE



Go right on to the next page.



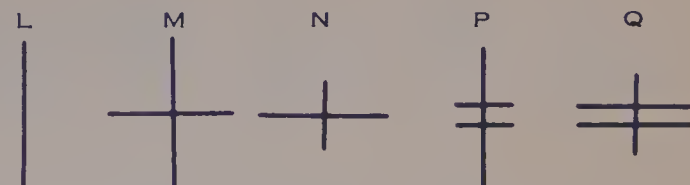
LEVEL D
BEGIN HERE

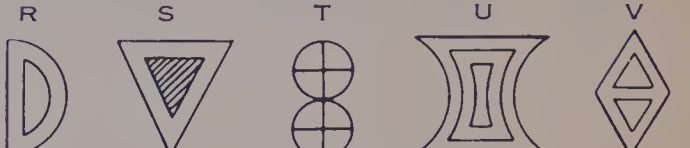


LEVEL E
BEGIN HERE



22.  

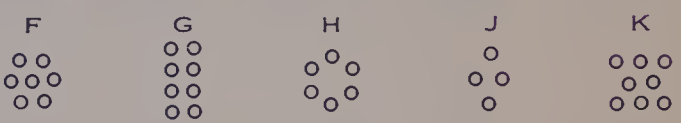
23.  

24.  

25.  

LEVEL **A** STOP HERE · WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

LEVEL F
BEGIN HERE 

26.  

27.  

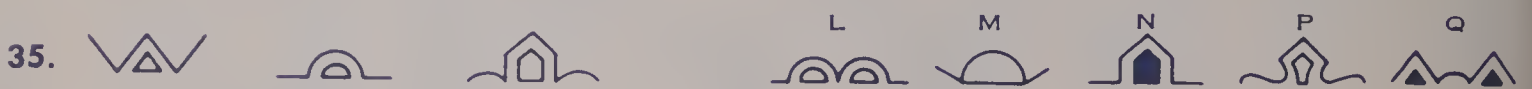
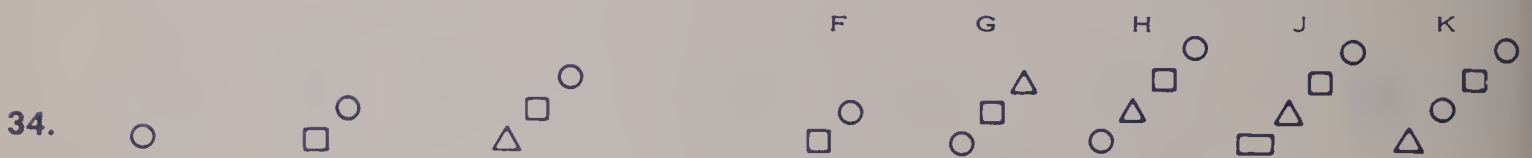
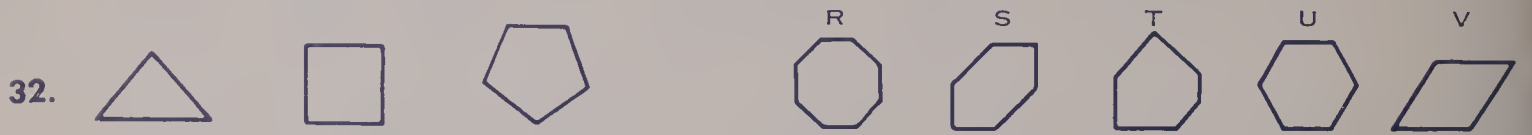
28.  

29.  

Levels B-F go right on to the next page.

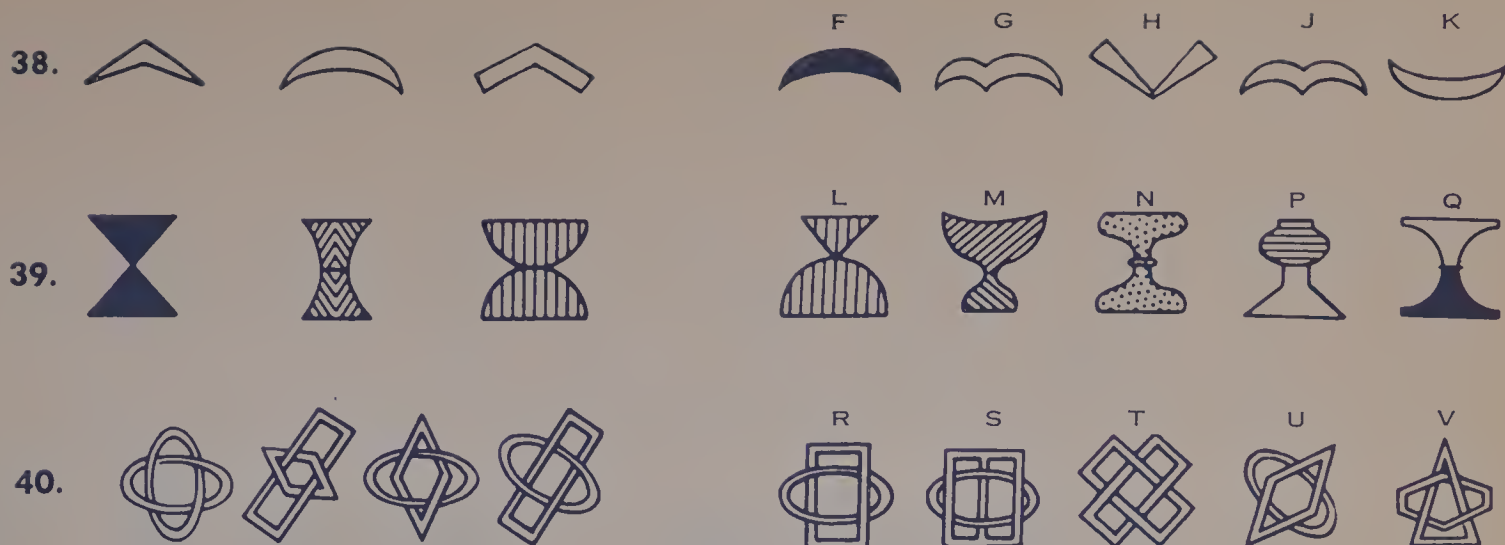


LEVEL **B** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

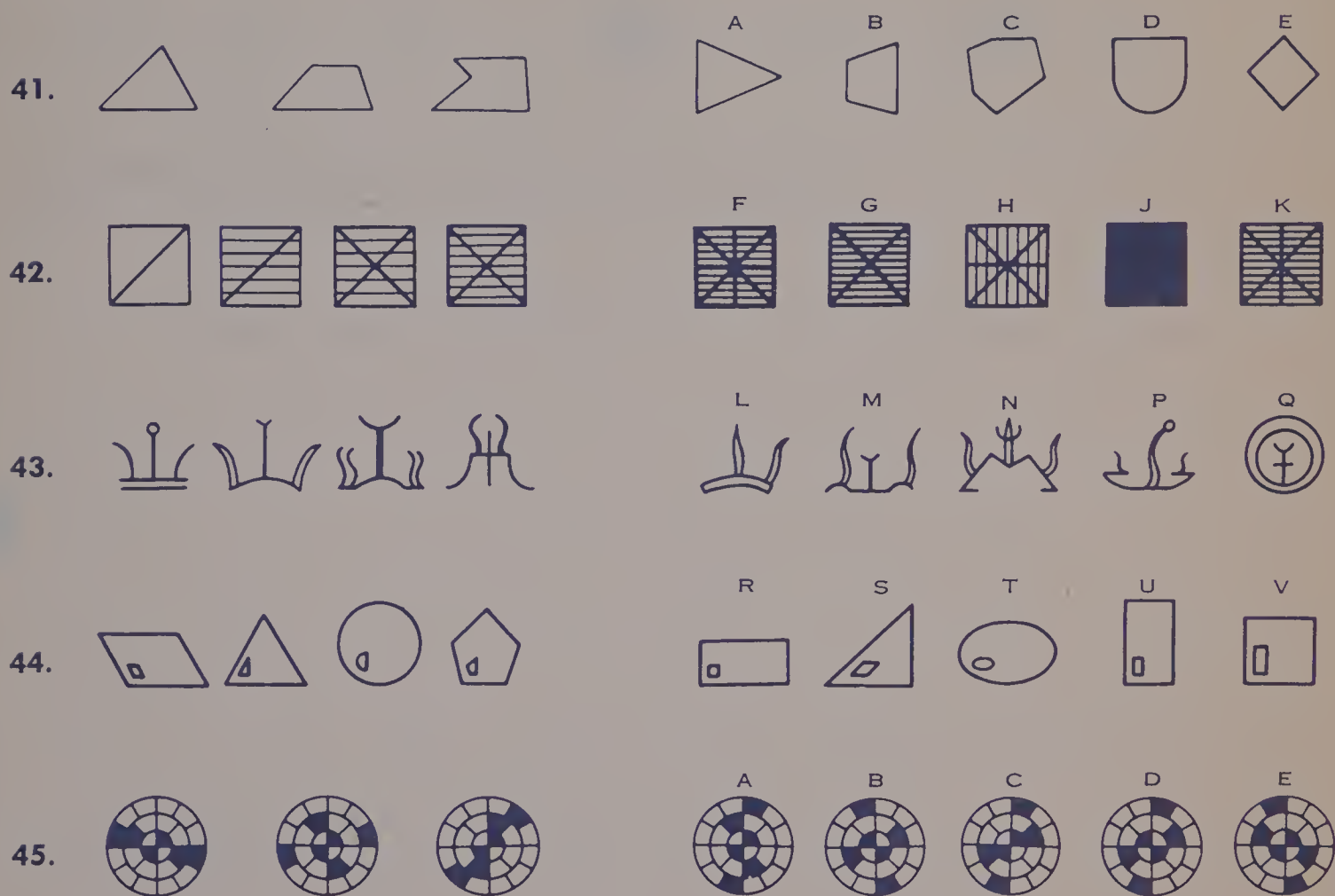


LEVEL **C** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2





LEVEL **D** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

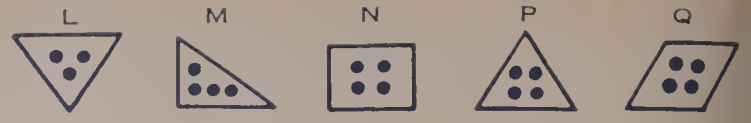


LEVEL **E** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2



Level F go right on to the next page.

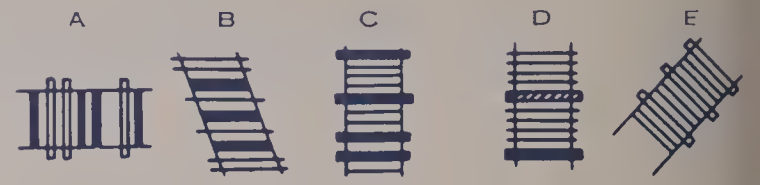
47.



48.



49.

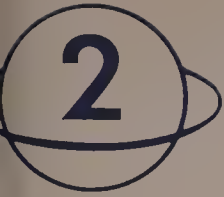


50.



LEVEL **F** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 2

DO NOT WRITE IN THIS BOOKLET.



INV A-F

For each exercise in this test a series of numbers or letters is given in a certain order. You are to figure out the order (or way) in which the series of numbers or letters is arranged, then find the number or letter at the right that should come next. Look at sample exercise 0.

0. 1 3 5 7 9 → A 10 B 11 C 12 D 13 E 14

In the series of numbers, 1 3 5 7 9, each number is 2 more than the number before it; therefore, the next number in the series should be 11. The letter in front of 11 is **B** so make a heavy black pencil mark in the **B** answer space for exercise 0.

Now look at exercise 00. Find the number that should come next.

00. 5 5 4 4 3 → F 1 G 2 H 3 J 4 K 5

The next number should be 3, so make a heavy black pencil mark in the **H** answer space for exercise 00.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 33, exercise 1	→	Exercise 25 on page 34
LEVEL B	→	Page 33, exercise 6	→	Exercise 30 on page 35
LEVEL C	→	Page 34, exercise 11	→	Exercise 35 on page 35
LEVEL D	→	Page 34, exercise 16	→	Exercise 40 on page 35
LEVEL E	→	Page 34, exercise 21	→	Exercise 45 on page 36
LEVEL F	→	Page 35, exercise 26	→	Exercise 50 on page 36

LEVEL A
BEGIN HERE



1. 3 4 5 6 → A 3 B 5 C 6 D 7 E 11

2. 5 10 15 20 25 → F 20 G 25 H 29 J 30 K 35

3. 101 202 303 404 → L 303 M 404 N 414 P 505 Q 515

4. a aa aaa → R a S aa T aaa U aaaa V aaaaa

5. 650 550 450 350 → A 250 B 300 C 350 D 400 E 450

LEVEL B
BEGIN HERE



6. 2 2 3 3 4 4 → F 2 G 3 H 4 J 5 K 8

7. a ab abc → L ab M abc N abcd P bcd Q d

8. 1a 2b 3c 4d → R 5a S 6e T 5e U 7g V 9h

Go right on to the next page.

9. 4 8 12 16 → A 14 B 18 C 20 D 22 E 26

10. 1111 1112 1122 1222 → F 1222 G 2122 H 2212 J 2221 K 2222

LEVEL C
BEGIN HERE

11. 11 22 33 44 → L 51 M 52 N 53 P 54 Q 55

12. 9 8 7 6 → R 5 S 6 T 7 U 9 V 10

13. 2 3 6 7 10 → A 11 B 12 C 13 D 14 E 15

14. $2\frac{2}{3}$ $3\frac{3}{4}$ $4\frac{4}{5}$ $5\frac{5}{6}$ → F $6\frac{5}{6}$ G $5\frac{4}{5}$ H $5\frac{3}{5}$ J $6\frac{6}{7}$ K $7\frac{7}{8}$

15. 22d 18d 14d 10d → L 2d M 4d N 6d P 8d Q 9d

LEVEL D
BEGIN HERE

16. 1 7 2 7 → R 3 S 4 T 5 U 6 V 7

17. 1 10 100 1000 → A 100 B 1000 C 1100 D 2000 E 10000

18. 8 13 11 16 14 19 17 → F 22 G 28 H 32 J 34 K 38

19. 12 9 13 10 14 11 → L 10 M 12 N 14 P 15 Q 16

20. 3b 6b 9b 12b → R 10b S 12b T 14b U 15b V 18b

LEVEL E
BEGIN HERE

21. 1112 1121 1211 → A 1111 B 1112 C 1121 D 1211 E 2111

22. 3 7 8 12 13 17 → F 18 G 19 H 20 J 21 K 22

23. 5 8 10 11 14 16 17 → L 18 M 19 N 20 P 23 Q 25

24. 18 17 15 11 10 8 4 → R 0 S 1 T 2 U 3 V 4

25. 12 48 9 36 6 24 → A 3 B 20 C 21 D 72 E 96

LEVEL **A** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

Levels B–F go right on to the next page.

LEVEL F
BEGIN HERE



26. 91 82 73 64 → F 54 G 55 H 56 J 57 K 58
27. 8b 7d 6f 5h → L 4i M 4j N 4k P 3j Q 3k
28. 806 617 826 637 → R 648 S 826 T 827 U 846 V 856
29. $\frac{1}{2}$ $\frac{3}{2}$ $\frac{3}{4}$ $\frac{5}{4}$ $\frac{5}{6}$ → A $\frac{5}{8}$ B $\frac{6}{5}$ C $\frac{6}{8}$ D $\frac{7}{6}$ E $\frac{7}{8}$
30. 16 21 23 24 29 31 32 → F 34 G 35 H 36 J 37 K 38

LEVEL B STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

31. ax bw cv du et → L fu M ft N fs P eu Q es
32. 7 13 9 15 11 17 13 → R 11 S 13 T 15 U 17 V 19
33. a+c b+d c+e d+f → A d+g B e+f C e+g D f+g E f+h
34. 30 36 22 28 15 21 9 → F 4 G 6 H 10 J 12 K 15
35. 129 257 385 413 → L 451 M 531 N 533 P 541 Q 542

LEVEL C STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

36. 16 28 8 14 4 7 → R $\frac{1}{2}$ S 1 T $1\frac{1}{2}$ U 2 V $3\frac{1}{2}$
37. 2 2 5 4 4 10 6 6 → A 3 B 8 C 12 D 14 E 15
38. 135 45 180 60 240 80 → F $\frac{1}{3}$ G 20 H 40 J 80 K 320
39. 2 6 4 12 6 18 → L 8 M 10 N 12 P 24 Q 54
40. 2 8 5 20 17 68 65 → R 61 S 62 T 65 U 195 V 260

LEVEL D STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

Levels E–F go right on to the next page.

- | | | | | | | | | | | | | | |
|------------|---------------|---------------|---------------|---------------|---------------|---------------|----------|------------------|------------------|------------------|------------------|------------------|-------|
| 41. | 36 | 35 | 32 | 27 | 26 | 23 | 18 | → | A 13 | B 14 | C 15 | D 16 | E 17 |
| 42. | 4 | 2 | 10 | 8 | 40 | 38 | 190 | → | F 93 | G 95 | H 188 | J 192 | K 950 |
| 43. | 42 | 38 | 35 | 34 | 30 | 27 | 26 | → | L 22 | M 23 | N 24 | P 25 | Q 26 |
| 44. | 3s-2t | 5t+3s | 7u-4r | 9v+5q | → | R 11w+6p | S 11w-6p | T 11v-6q | U 11x-6q | V 11x+6q | | | |
| 45. | $\frac{1}{2}$ | $\frac{2}{3}$ | $\frac{3}{5}$ | $\frac{4}{6}$ | $\frac{5}{8}$ | $\frac{2}{3}$ | → | A $\frac{6}{11}$ | B $\frac{7}{10}$ | C $\frac{7}{11}$ | D $\frac{8}{11}$ | E $\frac{8}{13}$ | |

LEVEL **E** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

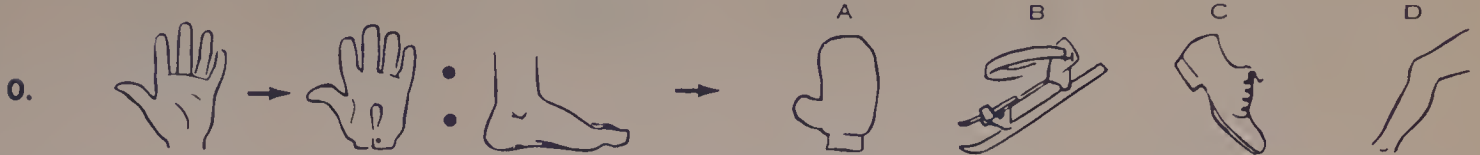
- | | | | | | | | | | | | |
|-----|----|----|----|----|----|------|------|------|------|------|------|
| 46. | 5 | 12 | 9 | 16 | 13 | 20 → | F 14 | G 17 | H 20 | J 21 | K 24 |
| 47. | 0 | 3 | 8 | 15 | 24 | 35 → | L 40 | M 42 | N 44 | P 46 | Q 48 |
| 48. | 40 | 6 | 32 | 8 | 24 | 10 → | R 12 | S 14 | T 16 | U 18 | V 20 |
| 49. | 6 | 7 | 9 | 8 | 12 | 9 → | A 10 | B 12 | C 14 | D 15 | E 18 |
| 50. | 54 | 81 | 18 | 27 | 6 | 9 → | F 2 | G 3 | H 4 | J 12 | K 15 |

LEVEL **F** STOP HERE • WAIT UNTIL YOU ARE TOLD TO GO AHEAD TO TEST 3

DO NOT WRITE IN THIS BOOKLET.



In each exercise in this test, the first two drawings go together in a certain way. You are to figure out how the first two go together, then find the drawing at the right that goes with the third drawing in the same way that the second goes with the first. Look at sample exercise 0.



The first two drawings go together because you wear a glove on your hand; therefore the right answer is the shoe because you wear a shoe on your foot. The letter in front of the drawing of the shoe is **C** so make a heavy black pencil mark in the **C** answer space for exercise 0.

Now look at exercise 00. Find the drawing at the right that goes with the third drawing in the same way as the second drawing goes with the first drawing.



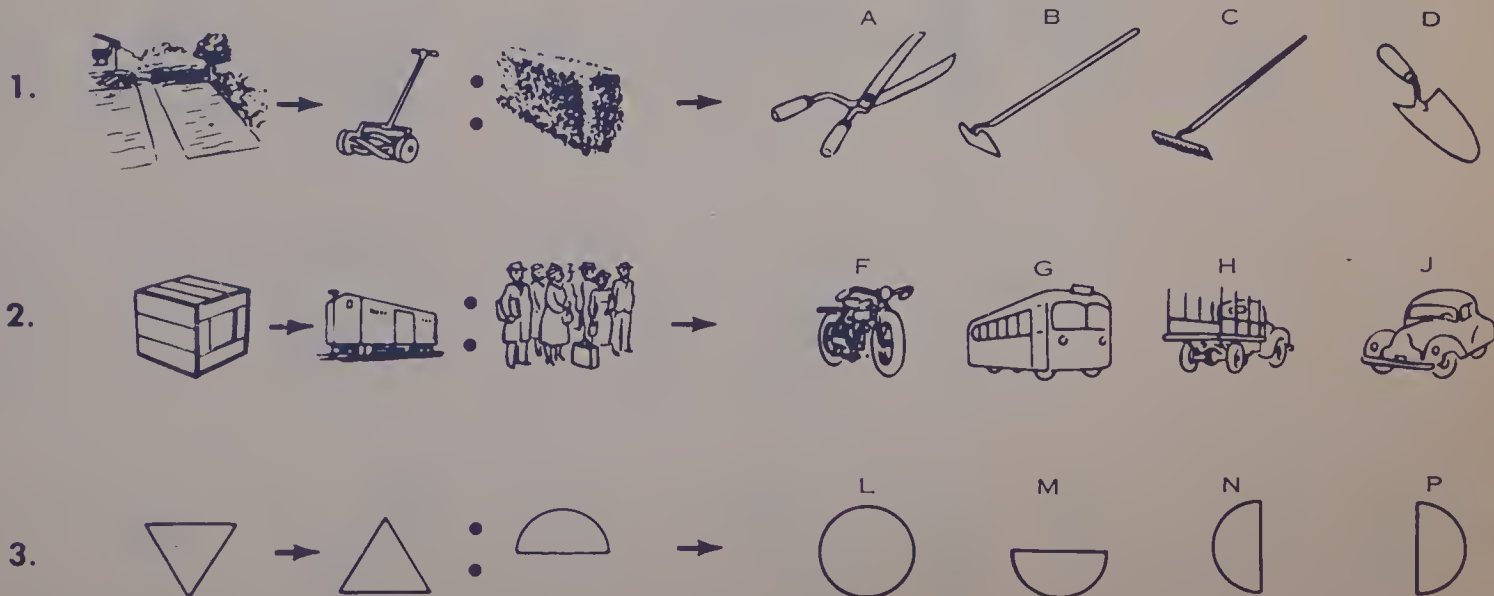
The right answer is **K**, because the little circle at **K** goes with the little square just as the big circle goes with the big square. Make a heavy black pencil mark in the **K** answer space for exercise 00.

Do all the exercises in this test the same way. Try every exercise in your section of the test.

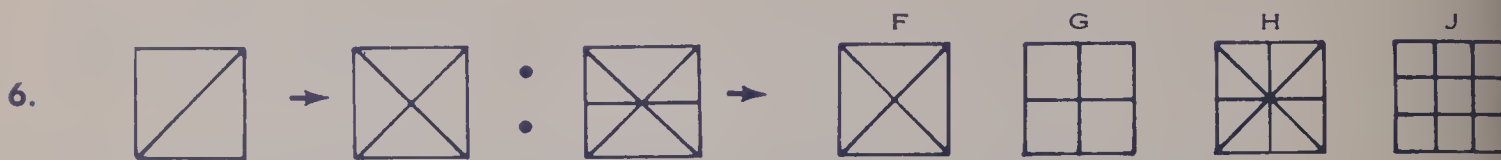
Use this table to find where your group is to begin and stop on this test.

	BEGIN	WITH	STOP	AFTER
LEVEL A	→	Page 37, exercise 1	→	Exercise 30 on page 41
LEVEL B	→	Page 38, exercise 7	→	Exercise 36 on page 41
LEVEL C	→	Page 39, exercise 13	→	Exercise 42 on page 42
LEVEL D	→	Page 39, exercise 19	→	Exercise 48 on page 43
LEVEL E	→	Page 40, exercise 25	→	Exercise 54 on page 43
LEVEL F	→	Page 41, exercise 31	→	Exercise 60 on page 44

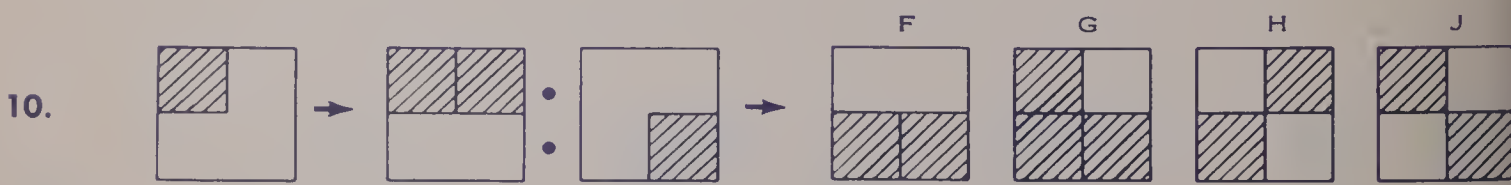
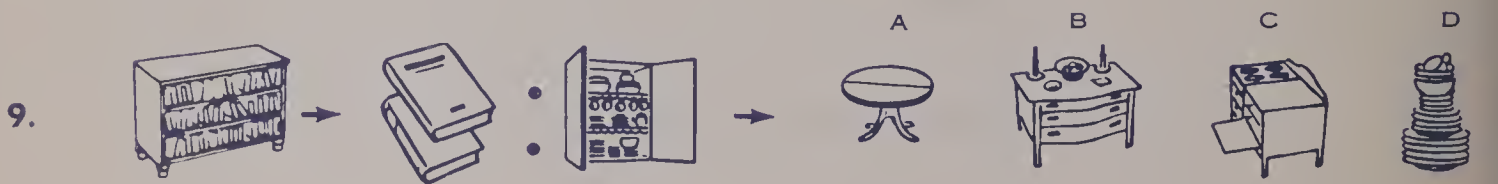
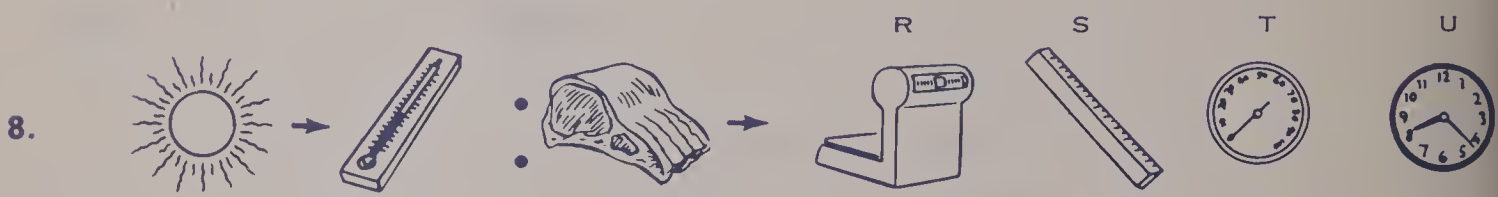
LEVEL A
BEGIN HERE

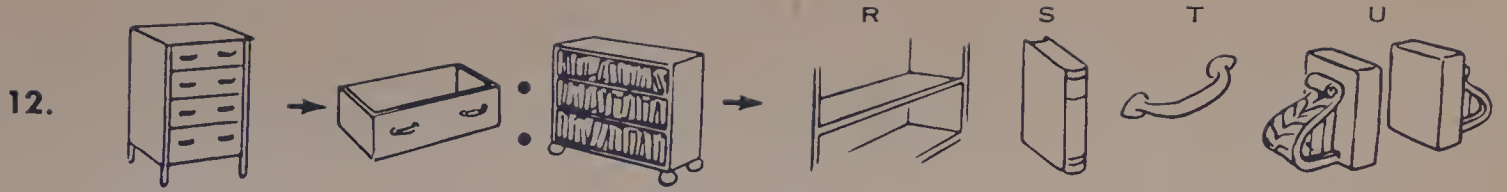


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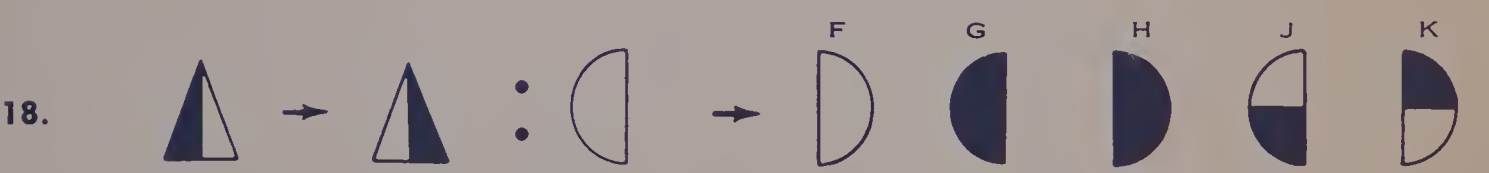
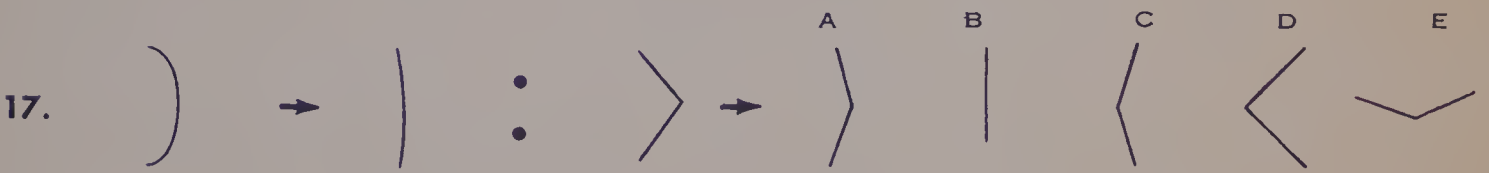
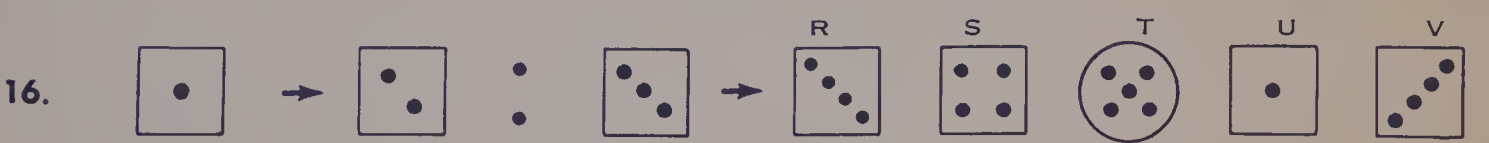
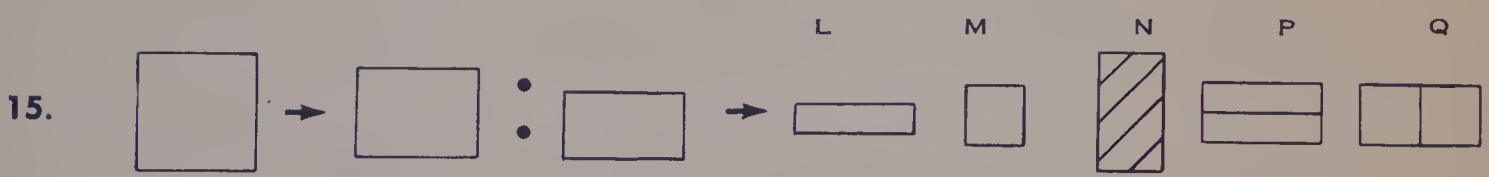
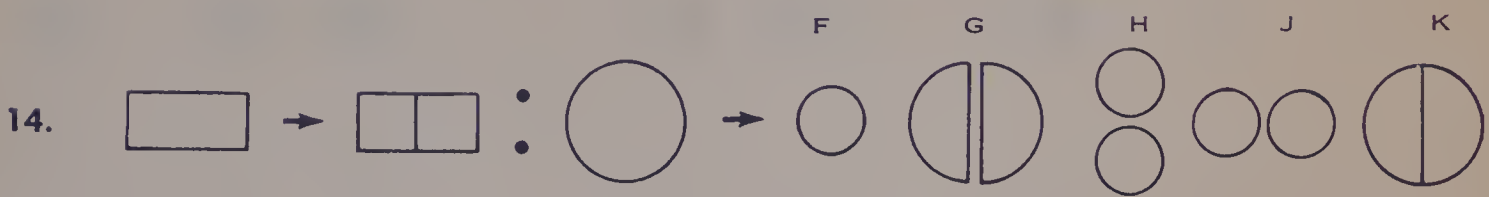
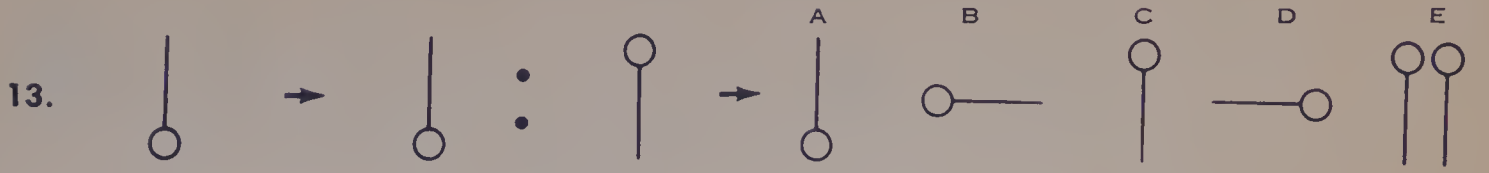


LEVEL B
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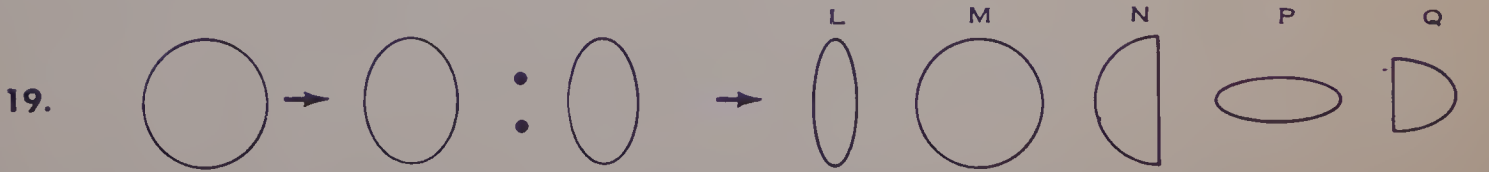




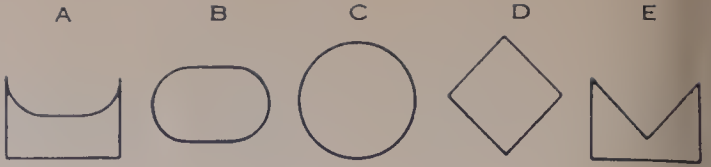
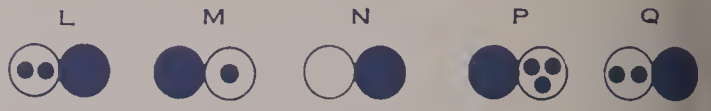
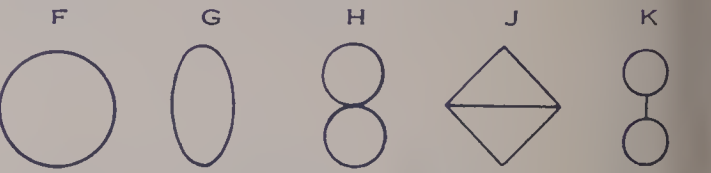
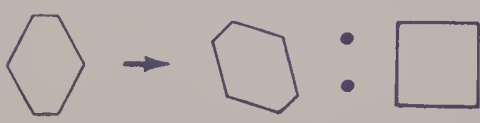
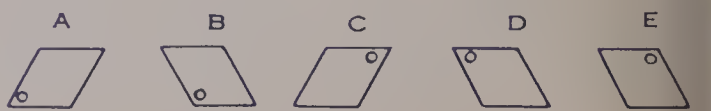
LEVEL C
BEGIN HERE



LEVEL D
BEGIN HERE



Go right on to the next page.

21.  → 
22.  → 
23.  → 
24.  → 
25.  → 
26.  → 
27.  → 
28.  → 
29.  → 

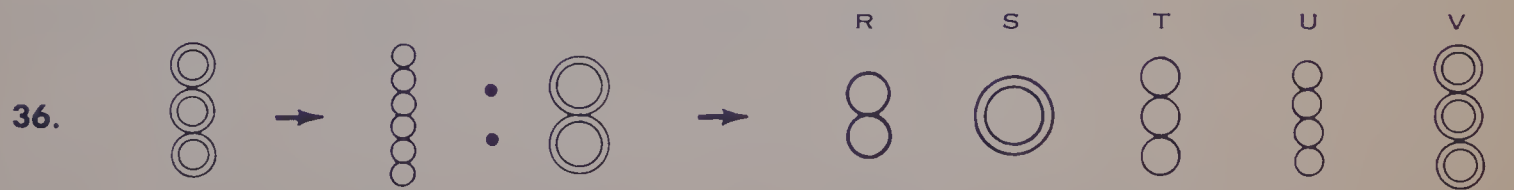
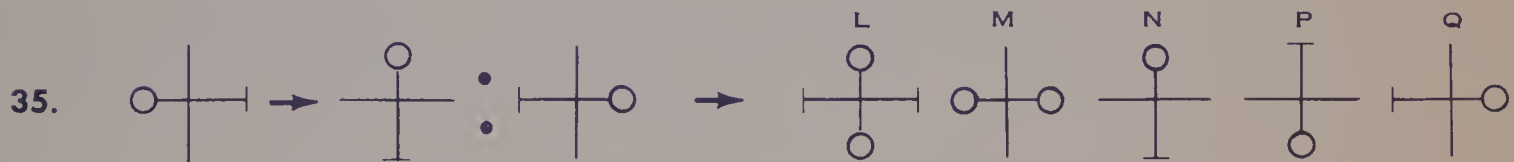
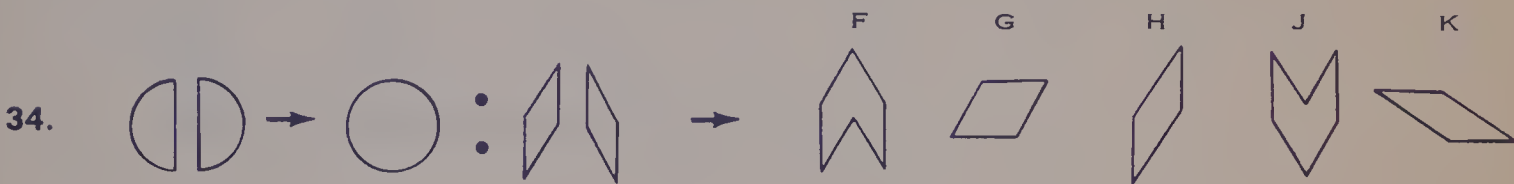
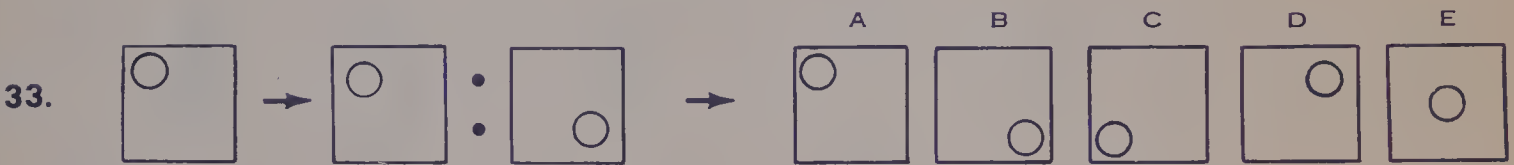
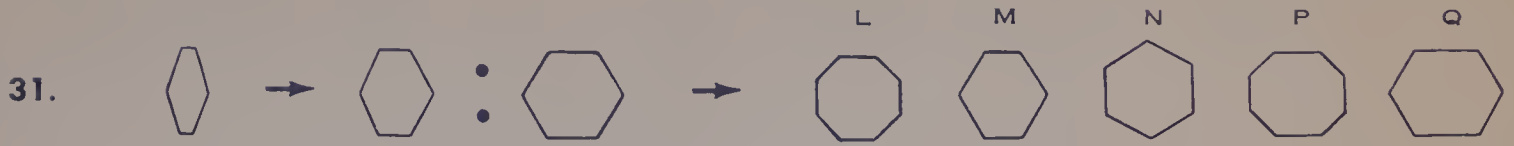
LEVEL E
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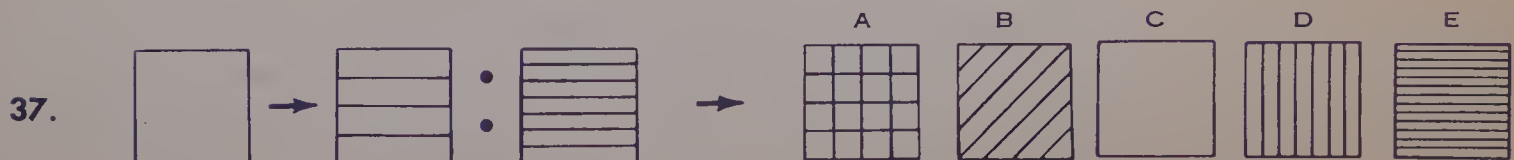


LEVEL **A** STOP HERE AND CLOSE YOUR TEST BOOKLET

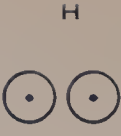
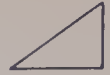
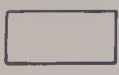
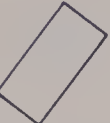
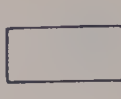
LEVEL F
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LEVEL **B** STOP HERE AND CLOSE YOUR TEST BOOKLET



Levels C-F go right on to the next page.

38.  →  :  →     
39.  →  :  →     
40.  →  :  →     
41.  →  :  →     
42.  →  :  →     

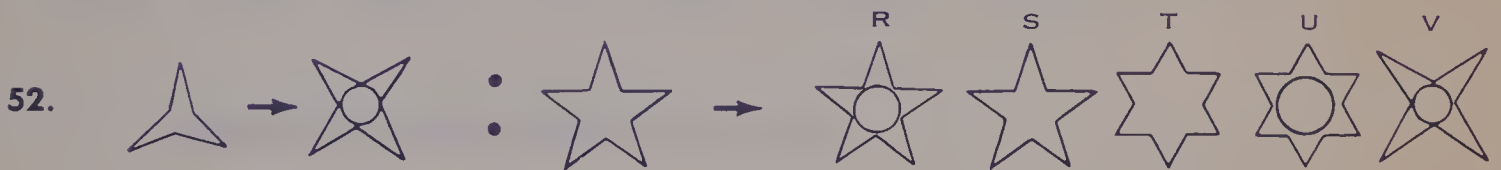
LEVEL C STOP HERE AND CLOSE YOUR TEST BOOKLET

43.  →  :  →     
44.  →  :  →     
45.  →  :  →     
46.  →  :  →     

Levels D-F go right on to the next page.

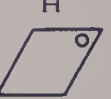
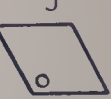
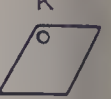


LEVEL **D** STOP HERE AND CLOSE YOUR TEST BOOKLET



LEVEL **E** STOP HERE AND CLOSE YOUR TEST BOOKLET

Level F go right on to the next page.

55.  →  :  →     
56.  →  :  →     
57.  →  :  →     
58.  →  :  →     
59.  →  :  →     
60.  →  :  →     

LEVEL **F** STOP HERE AND CLOSE YOUR TEST BOOKLET

CANADIAN LORGE-THORNDIKE INTELLIGENCE TESTS

Canadian Publisher

Thomas Nelson & Sons (Canada) Limited,
81 Curlew Drive,
Don Mills, Ontario.

The Canadian Lorge-Thorndike Intelligence Tests can be used in grades three through nine. Two forms of the tests are available. The individual test booklets are non-expendable. Pupils record their answers on separate answer sheets which may be hand-scored or machine-scored. Specimen kits may be purchased for examination of the test material.

Canadian Standardization

The Lorge-Thorndike Intelligence Tests, originally developed in the United States, were standardized in Canada in October and November of 1966 under the direction of Dr. Edgar N. Wright of the Toronto Board of Education. The standardization sample was selected to be representative of the English-speaking school population with respect to intelligence and achievement. In addition, the sample was selected so as to distribute the pupils across the provinces in the same proportion as the distribution of English-speaking children up to four years old in the 1961 census. This basic distribution would hold for grade three students in 1966-67 and this distribution was taken as the basic distribution for the total sample. A base sample of between 4,000 and 5,000 pupils was selected for each grade.

A stratified sample of schools was chosen on the basis of the following factors: province, Roman Catholic and non-Catholic schools, elementary schools and elementary schools with high school grades, and size of school as indicated by number of teachers.

To insure comparability of norms from grade to grade, all grades in a given school or designated fraction of a school were tested. When elementary schools were selected, the appropriate upper level schools were also selected for testing in other grade levels. In other words, graduates of the elementary schools were identified in the appropriate senior high school, junior high school, or secondary school for testing at grade levels beyond the elementary grades. When it was not possible to select the graduates for testing, the whole grade was tested. If the latter procedure produced an excessively large number of students, and graduates could not be identified, a random sample of classes at the upper levels were tested.

GATES —
MACGINITIE
READING TESTS

SURVEY D, FORM 3

Speed & Accuracy

Vocabulary

Comprehension



TEACHERS COLLEGE PRESS
TEACHERS COLLEGE
COLUMBIA UNIVERSITY
NEW YORK

To the Teacher:

BE SURE to follow the directions in the Manual (included in each test package) when giving these tests. The directions will tell you how to explain the tests and how to work the sample items with the students. Allow the exact time specified in the Manual.

	SPEED & ACCURACY		VOCABULARY	COMPREHENSION
	Number attempted	Number right		
Row score				Number right
Standord score				
Percentile score				
Grade score				

Name _____
(LAST) (FIRST)

Birth date _____ Boy _____ Girl _____
(MONTH, DAY, YEAR)

Grade _____ Testing date _____

Teacher _____

School _____

City _____

DIRECTIONS: Read sample paragraph S1. Under it are four words. Find the word that best answers the question.

S1. Mary pulled and tried to turn the knob. She could not turn it. It was a cold day to be locked outside. What was Mary trying to open?

box bag door safe

The word **door** is the best answer to the question. Draw a line under the word **door**.

Now read paragraph S2. Find the word below the paragraph that best completes the paragraph, and draw a line under it.

S2. The huge animals walked slowly, swinging their trunks from side to side. They had big floppy ears and long white tusks. These animals were

tigers deer lions elephants

The word **elephants** best completes paragraph S2. You should have drawn a line under the word **elephants**.

On the next two pages are more paragraphs like these samples. When you are asked to turn the page, read each paragraph and find the word below it that best answers the question or completes the paragraph. Draw a line under the best word. Mark only *one* word for each paragraph. Do the paragraphs in the order in which they are numbered: 1, 2, 3, etc. If you can't answer a question, go on to the next one. Work as fast as you can without making errors.

START

Speed and Accuracy

1. Because forest fires are so disastrous, lookout towers are built. From these stations, forest rangers are more likely to see the first sign of

mutiny letters fire times

2. Winnie-the-Pooh was a little boy's teddy bear. A story book was written about the little boy and Winnie-the-Pooh. What was Winnie-the-Pooh?

chair house hat toy

3. Bill wanted to study medicine. He knew he would have to go to school for many years and learn a very great deal before he could be a good

doctor neighbor test child

4. "Romba" has a long trunk and two fine ivory tusks. She seems pleased when people at the circus clap for her performance. What is "Romba"?

alligator mouse elephant monkey

5. The cardinal is a colorful bird of the southern and eastern United States. The male is red with black patches around its bill. This is a distinctive

fish flower butterfly bird

6. Date palm trees grow very tall. Near the top, the dates hang in clusters among the leaves. To reach these fruits a man must

stoop dive dig climb

7. Many of the American Indians wore moccasins. These were a type of shoe made from soft leather, often trimmed with beads. They were made from

wood leather cloth bark

8. It was time to go, but the wind was howling and blowing the snow about, and the temperature was dropping rapidly. The weather was both windy and

warm cold rainy peaceful

9. Jane heard a poem over the radio one night. The next day she repeated the poem perfectly. What kind of memory does Jane have?

good lost poor broken

10. To become King of England, Arthur had to pull a sword from a stone. Merlin, a magician, had put the sword there that Arthur had to

push pull sharpen break

11. The driver of a car should not try to study the road map while the car is moving. You can be a great help if you can read this map for the

repairs pilot driver sailor

12. President Thomas Jefferson was also an architect. He planned his own home and the capitol of Virginia. Who designed the capitol of Virginia?

Washington Jefferson Lincoln Adams

13. In 1682 William Penn founded a city which he called Philadelphia, from the Greek word meaning brotherly love. He wanted the city to be

friendly arrogant poor foreign

14. Limes are a good source of vitamin C. They are a greenish-yellow fruit that grows on citrus trees in warm climates. They provide

pearls nuts vitamins coffee

15. The largest of Columbus' ships was the "Santa Maria." The "Nina" was the smallest ship, and the "Pinta" was of medium size. Which was the biggest?

Columbus Pinta Nina Santa Maria

16. Children in many towns are asked to bring their bicycles for a safety check given by the local police. This is one way to reduce

accidents hunger disease weight

17. Every year Mary's class visits a school in northern Mexico. This school is conducted in Spanish. Where is it? There, Mary listens to classes and games in

Canada Spanish English Spain

18. The first Dutch colonists in the New World had few farm animals. A letter written home complained of "little or no butter." These settlers wanted

forests dogs cows deer

Speed and Accuracy

19. Some birds receive their names from the sound of their call. You may hear "chick-a-dee-dee" coming from a little black-capped bird. Which bird is this?

sparrow chickadee meadowlark robin

20. William Shakespeare was one of the greatest writers of plays. Most of his plays are still performed in theaters today. This man was a

millwright copyright playwright soldier

21. Beavers build their homes out of young trees. They cut down the trees with their teeth. What do they use to build their homes?

teeth hoofs saws horns

22. Astronaut Scott Carpenter ate cubes of food on his orbital journey. These snacks were prepared so that they could easily be eaten during the

flight preparation swim spring

23. Two timid wild creatures came out of the woods. I saw brown coats, long ears, and bits of white tails before they hopped away. These animals were

wildcats squirrels rabbits chipmunks

24. The Great Bear, which includes the Big Dipper, is a group of stars that sailors used to look at to chart their course. This Great Bear is in the

sky ocean forest mountain

25. The alpaca is a member of the camel family but is without a hump. In the Andes of South America it is kept for its strong, silky wool. It has no

value hump hair tail

26. Ferdinand Magellan set out with the first expedition to sail around the earth. The voyage proved beyond a doubt that the earth is round. He was

a Pilgrim an explorer a coward an astronomer

27. The word for water in Spanish is *agua*. In French it is *eau*, and in Italian it is *acqua*. What is the word for water in French?

cocoa agua acqua eau

28. Balloons with radio transmitters are sent into the air to send back information about atmospheric conditions. This information is used to forecast

luck business radio weather

29. Map makers use small marks called symbols to show locations of such features as towns and railroads. For an airport, a small airplane may be the

symbol target transport trouble

30. Oysters have two shells which are hinged together, and they can open and close. What is an oyster likely to do when an enemy approaches?

close shout run open

31. Quartz is a very hard stone. It can scratch even steel. If you wish to scratch your name on your knife blade, which of the following would you use?

glass lead wood quartz

32. In 1814, while the British lay siege to Baltimore, Francis Scott Key wrote the words of "The Star-Spangled Banner" which later became our national

flag capital security anthem

33. An ancient stone with the same message in Greek and Egyptian helped scholars learn to read Egyptian writing. Knowing Greek, they could decipher the

English French Egyptian Greek

34. Cities are often known for a particular reason. Portland, Oregon, celebrates the Rose Festival every June. For what is this city in Oregon famous?

desert flowers baked beans Golden Gate

35. Paris, the capital of France, is on the Seine River. Rome, in Italy, is on the Tiber River. What river runs through the capital of France?

Tiber Rhine Po Seine

36. In the shallow rivers of South America lives the electric eel. It produces sufficient electricity to stun other fish, which it can then

eat swim see charge

Vocabulary

DIRECTIONS: Look at the sample test word V 1 below. The word is **baby**. Now read the five words just below **baby**. Find the one word in this group that means most nearly the same as **baby**. The word **child** means most nearly the same as **baby**. Draw a line under the word **child**.

Now look at test word number V2. Find the one word in the group below it that means most nearly the same, and draw a line under it.

Slide means most nearly the same as **slip**. You should have drawn a line under the word **slide**.

For each numbered word on this page and the next page, draw a line under the word below it that means most nearly the same. If you can't decide which word means most nearly the same as a numbered test word, go on to the next test word.

SAMPLES

V1. baby

box
bath
nest
child
room

V2. slip

slide
neat
hop
smile
bad

4. pole

heap
score
pet
rod
pond

9. arose

sat down
got up
flower
serve
fought

14. cow

animal
pig
boat
soon
coat

5. float

swell
stay up
put on
dip
pour

10. comment

solid
timely
remark
bind
conquer

15. talk

peek
story
make
take
speak

1. blue

wind
same
color
flag
top

6. meadow

sky
lake
forest
pen
field

11. maid

friend
did
milk
cost
girl

16. warmth

buzz
rug
flag
heat
cold

2. patch

mend
clock
gun
hen
mail

7. garbage

waste
arch
halter
sarcasm
glove

12. bake

suit
cook
cry
behind
mix

17. run

skip
sing
look at
go fast
tag

3. knock

joint
pinch
hit
throw
march

8. apple

horn
fruit
chew
full
swift

13. location

chant
number
place
movement
acting

18. transformation

change
station
ugliness
bridge
power

Vocabulary

19. legislator

magician
tool
lawmaker
engineer
preacher

20. circular

round
sailor
hat
park
comic

21. scour

sulk
scrub
tally
acid
mean

22. vaporous

cowardly
misty
greedy
wicked
snaky

23. uncommon

plain
useful
private
proper
rare

24. transport

wave
stream
divide
carry
level

25. downy

white
heavy
coy
soft
cheap

26. defeat

soldier
beat
unbend
decide
useless

27. imply

startle
shove
threaten
block
suggest

28. sturdy

batter
stone
wide
work
firm

29. estimate

eliminate
alarm
honor
guess
cheat

30. swerve

chop out
lift up
speed
turn aside
fall down

31. persist

continue
die out
bother
reduce
abuse

32. hostile

tired
sick
opposed
plate
inviting

33. burden

load
ease
broken
send
count

34. congratulate

blame
shout
praise
assemble
audience

35. quaver

desire
squelch
case
tremble
flock

36. frightful

old
terrible
pretty
afraid
gleeful

37. insanity

dormitory
rubbish
craziness
orthodoxy
deadly

38. slain

scraped
cried
cleaned
caught
killed

39. roundabout

indirect
parallel
laborer
humble
neighbor

40. harass

help
annoy
swamp
guide
gear

41. confront

face
insult
gather
surface
perplex

42. confute

fill up
jumble
disprove
restrict
twist

43. agitate

mineral
exist
fortify
stir up
turn down

44. congenial

freezing
naughty
unsteady
forced
agreeable

45. dome

bee
roof
grave
planet
servant

46. nutriment

sand
particle
breeze
food
lecture

47. loam

soil
contract
return
canter
stone

48. malady

celebration
disorder
storm
alloy
noble

49. amethyst

opponent
surgeon
river
jewel
monstrosity

50. deficient

cocky
desperate
resisting
merry
lacking

Comprehension

DIRECTIONS: Read the sample paragraph below. It has numbered blanks in it. The first blank is number C1. Look below the paragraph at the line of words with C1 in front of it. Find the word in line C1 that makes the best sense in blank C1. The word **house** from line C1 makes the best sense in blank C1. The word **house** is the answer to number C1. Draw a line under the word **house**.

Now look at the words in line C2. Find the word in line C2 that makes the best sense in blank C2, and draw a line under it.

SAMPLE

We have a playroom in our ____C1____. It is down in the basement, so we need to turn on an electric ____C2____ even on sunny days.

C1. stove house bed car lake

C2. storm friend ladder room light

The word **light** makes the best sense in blank C2. You should have drawn a line under the word **light**.

Now draw a line under the best word for each of the blanks that follow on this page and on the next two pages. If you can't choose the best word for a blank, don't spend too much time on it. Go on to the next one.

After school Ray and John liked to play marbles in John's yard. John usually won, because he could ____1____ straighter than Ray. One day Dick came over to play with them. Dick won the most marbles. He was the ____2____ player of the three.

1. show shoot draw run try

2. best rest shortest poorest least

A park in the city is a good ____3____ to play. Joan goes to one every day. She has fun on the swings and the slides. She would like to swing as ____4____ as the treetops.

3. toy game place sight plays

4. low little fast high slow

A friendly gray squirrel lived in the park near our home. He worked diligently all fall gathering and ____5____ nuts. We knew he was storing food for ____6____.

5. hiding spending roasting cooling cheese

6. summer whither acorns nest winter

All the children wore costumes to Mary's Halloween party. Betty ____7____ a tall, black, pointed hat and carried a long, crooked stick. When Mary saw her, she said, "Oh, look! Betty is ____8____ like a witch."

7. walked wore cared hurt looked

8. flying broom seeing dressed face

Mike and Janet like to play in the sand by the seashore. When the tide is coming in, the ____9____ they dig are quickly ____10____ with water.

9. holds dishes capitals mountains holes

10. filled fried built fooled drilled

In the summertime, although it is often very hot in the city, it is cooler at the beaches and in the mountains. Many people leave the ____11____ during the ____12____ months to escape the heat.

11. summer screens ocean mountains cities

12. cool winter weather summer days

When the circus is in winter quarters, wagons must be painted, tents repaired, and young animals ____13____ to do tricks. If you could see behind the scenes, you would find the circus a very ____14____ place in winter.

13. telling performed trained learning teaching

14. blue inactive heavy vacant busy

Comprehension

In the frontier days a boy's education consisted of learning how to trap and hunt wild animals, how to make tools, and how to plow and plant. A girl ____ 15 ____ home industries, such as cooking and the making of cloth and candles. Little attention was paid to "book learning," as ____ 16 ____ and writing were called.

1. thought learned attended schooling worked
2. hunting farming sewing music reading

Scientists are trying to find the best ways of collecting and using the sun's power. They know that the sun's rays produce heat. If these ____ 17 ____ could be used in the right way, they could ____ 18 ____ much of the world's need for heat and power.

3. raise finds ways rays heat
4. supply shake react greatly divide

Rain was an important factor in the first successful flight across the English Channel in 1909. Bleriot, a Frenchman, made the crossing from France to England in a small monoplane. About the time he was halfway over, his engine became overheated and he feared it would stop. When rain began to fall, the engine cooled and the ____ 19 ____ continued on its way to the ____ 20 ____ shore. The flight was a ____ 21 ____.

5. dirigible airplane biplane automobile gyro
6. French American English Swiss Spanish
7. failure doubtful question mistake success

Tomorrow the circus moves on. As the spectators are enjoying the last performances, preparations for moving are already under way. As each act finishes, ____ 22 ____ pack their trunks. Roustabouts, who do much of the moving, pack equipment. Everything is done efficiently, and soon after the last ____ 23 ____ has gone home, the big ____ 24 ____ is on the road again.

8. audiences perfumes spectators performers pageants
9. spectator curtain circus equipment flight
10. tops gravel show pavement name

Many banks will permit you to open a savings account if you deposit a dollar. The bank book which they give you ____ 25 ____ that you have money in the bank. Each time you make a ____ 26 ____, it will be marked in your bank book.

25. indicts conceals indicates defers free
26. trouble dollar wage mistake deposit

A modern type of "covered wagon" goes west today. It goes north, south, and east as well. This is the house trailer. Some are plain and inexpensive, while others contain several rooms and are ____ 27 ____ with electric lights, hot and cold water, refrigerators, and television. In fact, this house on wheels may be as ____ 28 ____ as its owner wishes.

27. short equipped covered affected experienced
28. far complete happy designed necessary

Light waves travel faster than sound waves. If you are close to a firecracker that is being shot off, you will see a flash of light and hear a noise at almost the same time. But the ____ 29 ____ you go from the firecracker, the greater the difference there will be between the time you ____ 30 ____ the flash and the time you hear the ____ 31 ____ of the explosion.

29. closer nearer sooner farther warmer
30. hear see set stop want
31. sound flash light heat fire

The tall tales that are told about Paul Bunyan are among the tallest of all such tales. They make Paul the greatest ____ 32 ____ of the lumber camps. One such tale tells that Paul ____ 33 ____ out the Great Lakes in order to ____ 34 ____ a drink for his giant blue ox, Babe.

32. river machine hearer hero tower
33. sent played went jumped scooped
34. pursue fine provide become bake

Dark clouds began to ___ 35 ___ rapidly in the northwest and the air became very hot and damp. Jerry, who had started on a hike, looked ___ 36 ___ at the sky. Then, calling to Mike, his dog, who had been wandering ahead, he ___ 37 ___ back home.

35. disappear count clear gather disperse
36. carelessly anxiously lightly friendly completely
37. sent sang hurried crawled threw

In 1962 the Nobel Peace Prize was given to Dag Hammarskjöld. This outstanding man was ___ 38 ___ the prize for his ___ 39 ___ to bring peace to the Congo and to ease world tensions. It was while he held the ___ 40 ___ of Secretary-General of the United Nations that he made his great contributions to world peace.

38. denied awarded taken won sold
39. attacks stories reluctance education efforts
40. flag prize office postage emblem

The United States and Canada worked together to build the St. Lawrence Seaway. This two-hundred-mile ___ 41 ___ provides a route along which ships can travel from the Atlantic Ocean to the Great Lakes. It is seen as a good ___ 42 ___ of what two countries can do when they ___ 43 ___ for the common good.

41. highway hour minute channel shipping
42. example time neighbor fortune way
43. divide concern alliance travel cooperate

The rubber we use may be either natural or synthetic. Natural rubber comes from the milky sap of a tree. ___ 44 ___ rubber, made under the guidance of chemists, is a factory ___ 45 ___. It can be made heat resistant and, in this and some other ways, is a product superior to ___ 46 ___ rubber.

44. Synthetic Natural Guided Sympathetic Assembled
45. building superior chemist product purpose
46. national natural synthetic band foam

Paperbacks are generally less expensive than hardcover books. Two of the reasons for their lower ___ 47 ___ are mass production and mass distribution. The cooperation of newsstands and wholesale magazine firms makes mass ___ 48 ___ easy. High-speed printing presses and binding machines make mass ___ 49 ___ possible.

47. yield speed cost covers sale
48. travel distribution market expense production
49. motion distribution costs margin production

Weather reports in the United States are based partly on observations from arctic and subarctic regions. Using these observations, ___ 50 ___ can be made for several days ahead. However, only day-to-day predictions can be very ___ 51 ___. Longer predictions are more ___ 52 ___.

50. trips storms winds predictions aircraft
51. exact popular bad wrong left
52. often over tentative certain exact

GATES-MacGINITIE READING TESTS

Canadian Publisher

Guidance Centre,
The College of Education,
University of Toronto,
1000 Yonge Street,
Toronto 289, Ontario.

The Gates-MacGinitie Reading Tests, Survey D, can be used in grades four through six. There are three forms of the tests. These tests are available in either the hand-scored expendable form or in the form of non-expendable booklets with separate answer sheets. These answer sheets may be hand- or machine-scored. Inexpensive specimen kits may be purchased for examination of the test materials.

Standardization

The Gates-MacGinitie Reading Tests replace the earlier Gates Reading Survey. The norms for the new tests are based on a new, nationwide standardization done in the United States and were developed by administering the tests to approximately 40,000 pupils in 38 communities. The technical manual indicates that the communities were carefully selected on the basis of size, geographical location, average educational level, and average family income.

The main normative testing was carried out in October, 1964. The resultant norms, therefore, should reflect more accurately current reading achievement than do those norms on other tests on which the normative procedures were done prior to 1964.

Reliability

The reliability coefficients were calculated using both alternate form and split-half procedures. The reliability coefficients for Survey D of the Gates-MacGinitie Reading Tests are given in Table XX.

Validity

Two types of validity coefficients are available for Survey D of the Gates-MacGinitie Reading Tests. Validity based on correlations between the subtests is given in Table XXI, while Table XXII presents validity coefficients based on correlations between the reading subtest scores and the Lorge-Thorndike Verbal Intelligence Quotients.

TABLE XX

RELIABILITY COEFFICIENTS OF READING SUBTESTS

Grade	Subtest Score ¹	Average Raw Score Mean	Average Raw Score Standard Deviation	Alternate Form Reliability	Split half Reliability
4	Vocabulary	18.6	7.9	.85	.88
	Comprehension	20.3	10.8	.83	.94
	Speed No. Attempted	16.8	6.6	.67	-
	Speed No. Correct	12.0	5.0	.80	-
5	Vocabulary	27.2	9.3	.87	.92
	Comprehension	32.2	11.9	.89	.96
	Speed No. Attempted	21.6	4.4	.75	-
	Speed No. Correct	17.4	4.8	.76	-
6	Vocabulary	31.3	8.3	.85	.89
	Comprehension	36.9	11.1	.87	.95
	Speed No. Attempted	24.8	3.3	.72	-
	Speed No. Correct	17.9	5.7	.78	-

¹ The subtest scores are for the Gates-MacGinitie Reading Tests, Survey D. The reliability coefficients given in this table are presented in the Technical Manual for the Gates-MacGinitie Reading Tests (Gates and MacGinitie, 1965b, p. 8).

TABLE XXI

CORRELATION BETWEEN SUBTESTS OF THE GATES-MACGINITIE READING TESTS

Grade	Vocabulary		Comprehension		No. Attempted
	Comprehension ¹	No. Attempted (Speed)	No. Correct (Speed)	No. Attempted (Speed)	
4	.77	.32	.68	.28	.72
5	.70	.19	.55	.18	.55
6	.77	.26	.63	.17	.65

¹ The correlation coefficients given in this table are presented by Gates and MacGinitie (1965b, p. 8).

TABLE XXII

CORRELATION BETWEEN GATES-MacGINITIE READING SUBTEST SCORES AND
LORGE-THORNDIKE VERBAL INTELLIGENCE QUOTIENTS

GRADE	INTELLIGENCE QUOTIENTS			
	Vocabulary ¹	Comprehension	No. Attempted (Speed)	No. Correct (Speed)
4	.60	.60	.18	.51
5	.74	.76	.27	.58
6	.77	.72	.44	.64

¹ The correlation coefficients given in this table are presented by Gates and MacGinitie (1965b, p. 8).

APPENDIX D

RAW DATA

TABLE XXIII

AGE OF PUPILS AND NUMBER OF YEARS SPENT IN SCHOOL

Test Group	Pupil I.D.	No. of Years in School	Chronological Age in Months
Grade Four Disabled Readers	01	5	125
	02	6	144
	03	5	132
	04	6	143
	05	6	141
	06	5	126
	07	6	144
	08	7	154
	09	6	146
	10	4	120
	11	5	136
	12	4	121
	13	6	143
	14	5	127
	15	5	130
	16	6	141
	17	4	119
	18	5	129
Grade Four Able Readers	19	4	117
	20	4	116
	21	4	116
	22	4	114
	23	4	113
	24	4	124
	25	4	122
	26	4	124
	27	4	115
	28	4	124
	29	4	119
	30	4	120
	31	4	115
	32	4	121
	33	4	121
	34	4	121
	35	4	124

TABLE XXIII (Continued)

Test Group	Pupil I.D.	No. of Years in School	Chronological Age in Months
Grade Six Disabled Readers	36	7	157
	37	8	169
	38	8	166
	39	8	172
	40	6	147
	41	7	150
	42	8	167
	43	8	164
	44	8	168
	45	8	165
	46	6	145
	47	8	162
	48	6	141
Grade Six Able Readers	49	5	133
	50	5	131
	51	6	144
	52	6	143
	53	6	148
	54	6	147
	55	6	138
	56	6	143
	57	6	144
	58	6	140
	59	6	137
	60	6	138
	61	6	147
	62	6	142
	63	6	144
	64	6	140
	65	6	137
	66	6	147

TABLE XIV
INTELLIGENCE QUOTIENTS OF PUPILS

TEST GROUP	PUPIL I.D.	INTELLIGENCE QUOTIENTS ¹	
		Verbal	Non-Verbal
Grade Four	01	85	105
Disabled	02	61	74
Readers	03	62	77
	04	60	81
	05	70	85
	06	74	73
	07	79	92
	08	65	91
	09	61	86
	10	89	114
	11	67	93
	12	76	87
	13	70	90
	14	74	83
	15	68	80
	16	72	80
	17	87	104
	18	69	81
Grade Four	19	120	108
Able Readers	20	105	113
	21	123	122
	22	120	110
	23	108	99
	24	108	103
	25	115	107
	26	112	130
	27	122	109
	28	120	128
	29	117	114
	30	114	126
	31	113	106
	32	118	122
	33	130	112
	34	105	122
	35	102	110

¹Intelligence quotients are derived from the Canadian Lorge-Thorndike Intelligence Tests, Levels A to F, Form 1.

TABLE XXIV (Continued)

TEST GROUP	PUPIL I.D.	INTELLIGENCE QUOTIENTS	
		Verbal	Non-Verbal
Grade Six	36	77	87
Disabled	37	66	74
Readers	38	68	95
	39	77	84
	40	99	97
	41	85	90
	42	59	77
	43	79	88
	44	58	103
	45	69	97
	46	78	96
	47	76	94
	48	96	99
Grade Six	49	135	129
Able Readers	50	135	127
	51	103	109
	52	112	121
	53	128	112
	54	112	118
	55	108	135
	56	131	132
	57	112	104
	58	115	101
	59	110	112
	60	106	122
	61	105	111
	62	119	110
	63	127	108
	64	108	115
	65	129	124
	66	132	118

TABLE XXV

SCORES MADE BY PUPILS ON READING SUBTESTS¹

PUPIL I.D.	SPEED		ACCURACY		VOCABULARY		COMPREHENSION	
	Standard Score	Percentile Score	Standard Score	Percentile Score	Standard Score	Percentile Score	Standard Score	Percentile Score
01	41	18	40	16	43	24	39	14
02	56	73	35	7	33	4	36	8
03	39	14	35	7	48	42	36	8
04	35	7	29	2	30	2	30	2
05	35	7	34	5	40	16	33	4
06	41	18	39	14	40	16	35	7
07	33	4	32	4	40	16	39	14
08	33	4	29	2	30	2	33	4
09	30	2	29	2	30	2	30	2
10	33	4	34	5	34	5	47	38
11	30	2	29	2	36	8	43	24
12	30	2	29	2	30	2	30	2
13	53	62	39	14	35	7	32	4
14	33	4	29	2	34	5	37	10
15	35	7	34	5	40	16	36	8
16	38	12	40	16	44	27	41	18
17	39	14	32	4	41	18	42	21
18	39	14	35	7	43	24	42	21
19	53	62	56	73	54	66	55	69
20	52	58	51	54	52	58	51	54

¹ The subtests for which scores are given are the subtests of the Gates-MacGinitie Reading Tests, Survey D, Form 3.

TABLE XXV (Continued)

PUPIL I.D.	SPEED		ACCURACY		VOCABULARY		COMPREHENSION	
	Standard Score	Percentile Score	Standard Score	Percentile Score	Standard Score	Percentile Score	Standard Score	Percentile Score
21	52	58	56	73	73	99	66	95
22	66	95	63	90	62	88	50	50
23	53	62	54	66	52	58	51	54
24	53	62	54	66	65	93	52	58
25	51	54	54	66	63	90	61	86
26	56	73	61	86	90	98	58	79
27	57	76	61	86	65	93	63	90
28	59	82	66	95	70	98	69	97
29	50	50	52	58	68	96	60	84
30	47	38	49	46	48	42	55	69
31	51	54	54	66	57	76	59	82
32	53	62	57	76	63	90	59	82
33	66	95	73	99	56	73	63	90
34	52	58	52	58	59	82	53	62
35	45	31	45	31	51	54	54	66
36	30	2	33	4	38	12	46	34
37	30	2	29	2	36	8	30	2
38	30	2	31	3	36	8	34	5
39	41	18	39	14	44	27	47	38
40	71	98	65	93	61	86	43	24
41	39	14	40	16	47	38	41	18
42	30	2	29	2	30	2	30	2
43	41	18	43	24	51	54	46	34
44	30	2	29	2	30	2	30	2

TABLE XXV (Continued)

PUPIL I.D.	SPEED		ACCURACY		VOCABULARY		COMPREHENSION	
	Standard Score	Percentile Score	Standard Score	Percentile Score	Standard Score	Percentile Score	Standard Score	Percentile Score
45	30	2	29	2	36	8	33	4
46	47	38	46	34	39	14	42	21
47	32	4	31	3	34	5	30	2
48	52	58	53	62	51	54	44	27
49	62	88	70	98	63	90	52	58
50	58	79	65	93	57	76	66	95
51	58	79	65	93	57	76	55	69
52	55	69	62	88	61	86	66	95
53	59	82	65	93	65	93	55	69
54	53	62	58	79	68	96	58	79
55	52	58	53	62	61	86	58	79
56	58	79	65	93	65	93	66	95
57	58	79	64	92	60	84	63	90
58	56	73	60	84	65	93	52	58
59	48	42	50	50	55	69	57	76
60	51	54	53	62	57	76	55	69
61	54	66	60	84	63	90	53	62
62	42	21	44	27	55	69	58	79
63	54	66	58	79	61	86	60	84
64	50	50	52	58	60	84	51	54
65	59	82	65	93	58	79	63	90
66	56	73	64	92	68	96	60	84

TABLE XXVI
SCORES ON CLASSIFICATION ABILITY TEST

GRADE FOUR DISABLED READERS		GRADE FOUR ABLE READERS		GRADE SIX DISABLED READERS		GRADE SIX ABLE READERS	
Pupil I.D.	Test Score ¹	Pupil I.D.	Test Score	Pupil I.D.	Test Score	Pupil I.D.	Test Score
01	11	19	14	36	12.5	49	15.5
02	10	20	15	37	8.5	50	16.5
03	11.5	21	14	38	10.5	51	14.5
04	11.5	22	10.5	39	12	52	12.5
05	9	23	10	40	12.5	53	14
06	6.5	24	12	41	9	54	15
07	8.5	25	13	42	8.5	55	14
08	8.5	26	16.5	43	13	56	15.5
09	5.5	27	11	44	10	57	15
10	11	28	10	45	11.5	58	15
11	12.5	29	10.5	46	12.5	59	12.5
12	12	30	13.5	47	12.5	60	13
13	8	31	13.5	48	8.5	61	14
14	8.5	32	15			62	13
15	7.5	33	13.5			63	13
16	7	34	11			64	14.5
17	10	35	12			65	16
18	7.5					66	13.5

¹The test score is the total score the pupil made on the Concept Formation Ability Test.

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